

# The Chemical Age

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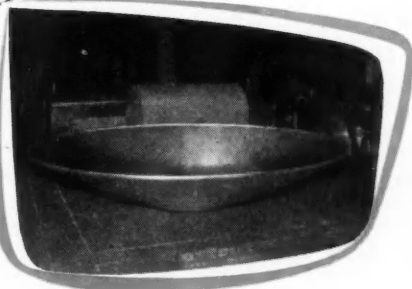


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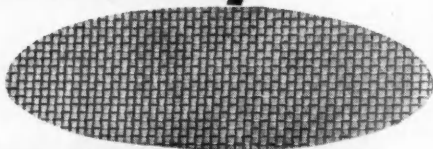
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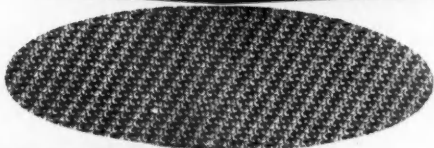
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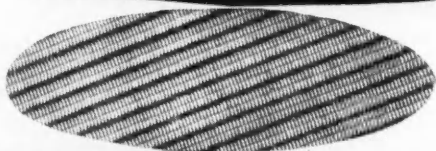
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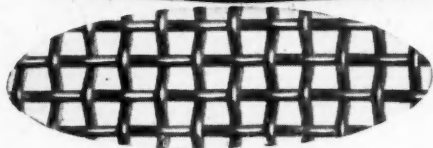
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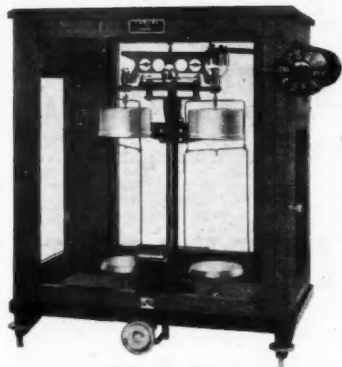
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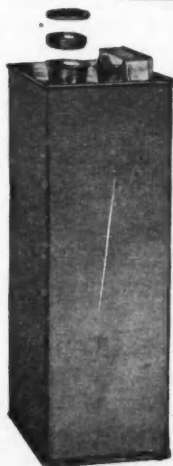
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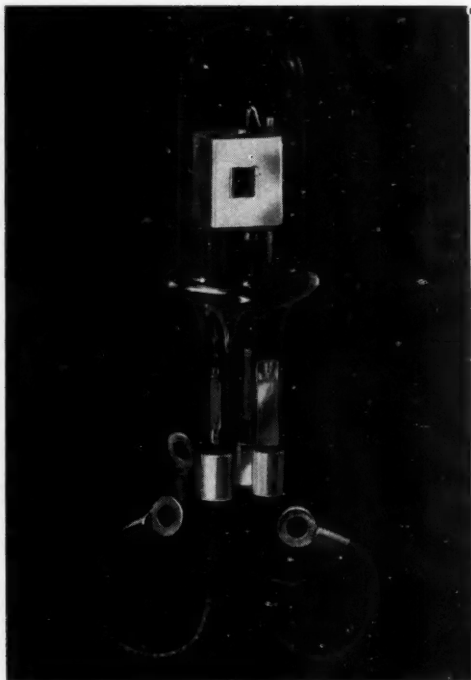
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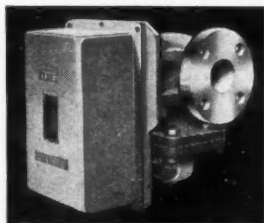
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# INDEX TO ADVERTISERS IN THIS ISSUE

	Page		Page
Airey, Robert, & Son, Ltd.	xv	Innes, J. K., & Co., Ltd.	viii
Alumina Co., Ltd. (The)	viii	International Filters, Ltd.	xi
A.P.V. Co., Ltd. (The)	Front Cover		
		Jones, Tate & Co., Ltd.	iii
Berk, F. W., & Co., Ltd.	ix	Kestner Evaporator & Eng. Co., Ltd.	x, xvi
Blundell & Crompton, Ltd.	Cover iii	Leeds & Bradford Boiler Co., Ltd.	xiv
British Carbo-Norit Union, Ltd.	xvi	Leigh & Sons Metal Works, Ltd.	xvi
British Drug Houses, Ltd.	135		
British Thomson-Houston Co., Ltd. (The)	iv	Milner, John, & Sons, Ltd.	xiv
		Negretti & Zambra, Ltd.	xv
Carty & Son, Ltd.	xii	Orr, George, W., & Co., Ltd.	viii
Cheshire Engineering Co., Ltd.	viii	Penrhyn Quarries, Ltd.	xvi
Classified Advertisements	140, xiii, xiv	Reynolds, T. A., Son & Wardale, Ltd.	x
Cole, R. H., & Co., Ltd.	xii		
		Stanton Instruments, Ltd.	v
Evans, Adlard, & Co., Ltd.	vi	Sutcliffe, Speakman & Co., Ltd.	Cover iv
		Thermal Syndicate, Ltd. (The)	ii
Farwig, J. F., & Co., Ltd.	i	Towers, J. W., & Co., Ltd.	i
Feltham, Walter H., & Son, Ltd.	xvi		
Ferranti, Ltd.	xv	Wallis, Charles, & Sons (Sacks), Ltd.	xiv
Fielding, T. H., & Sons, Ltd.	xiv	Watford Chemical Co., Ltd. (The)	xvi
		Wilkinson, James, & Son, Ltd.	Cover iii, vii
Geigy Co., Ltd. (The)	vi	Wood, Harold, & Sons, Ltd.	xiv
Greening, N., & Sons, Ltd.	Cover ii		
Greenwich Pump & Plant Co., Ltd. (The)	xvi		
Guest Industrials, Ltd.	139, xv		
Harris (Lostock Gralam), Ltd.	Cover iii		
Haughton's Metallic Co., Ltd.	xvi		
Hess Products, Ltd.	137		

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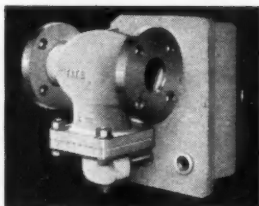


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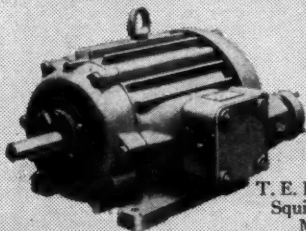
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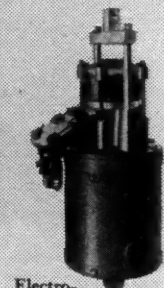


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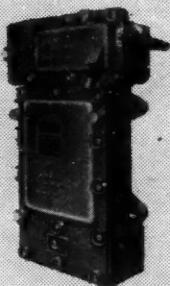
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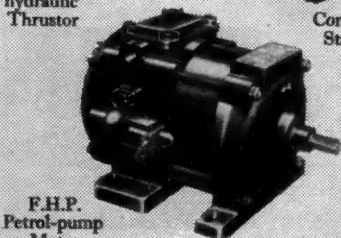
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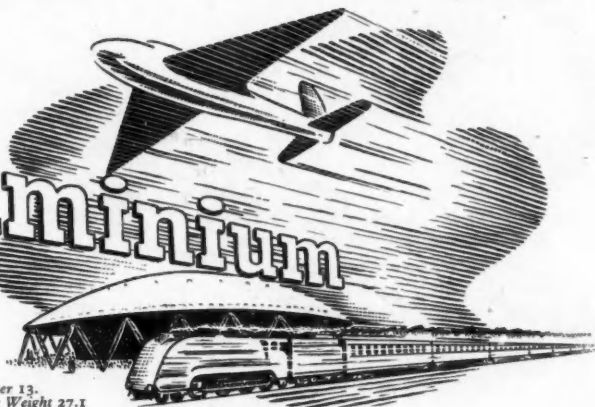
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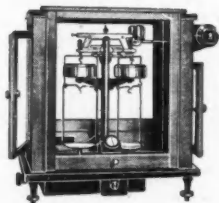
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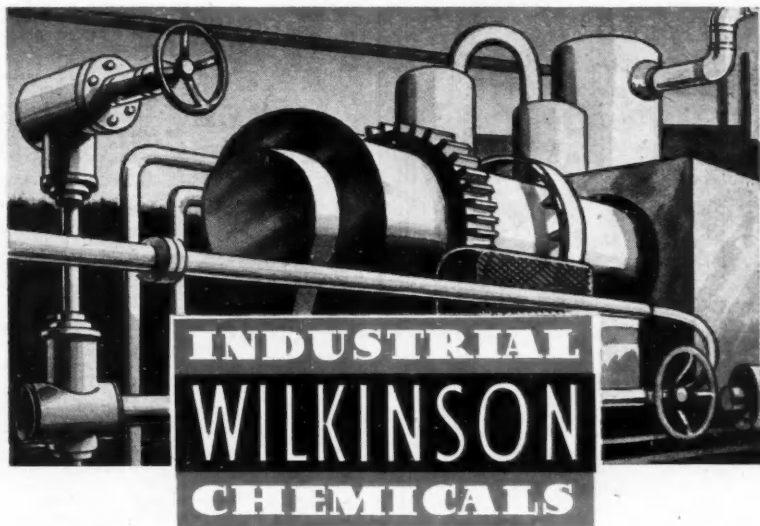
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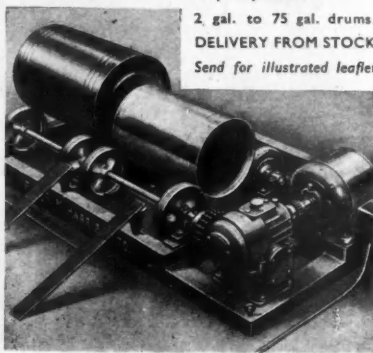
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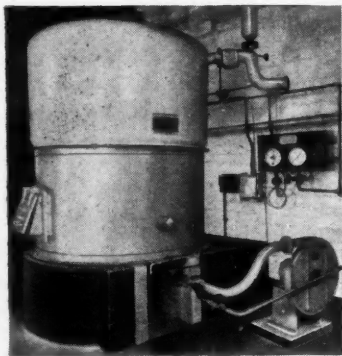
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26 July 1952

Number 1724

## Letting People Know

OUR insistence that the chemical industry cannot afford to be secretive or modest will not be unfamiliar to readers. No proverb is more out-dated by change and circumstance than the one about bush and good wine. Publicity, public relations, information services—call it or them what you will—have now become a professional art-cum-science and all sorts and conditions of wine, from the good to the poor, clamour skilfully for the popular ear. Familiarity does not breed contempt; it breeds recognition and remembrance. For an individual the unsung path may be laudably followed and credit, if it is due, may still come in the end. For the vast and almost abstract aggregation of effort that we call an 'industry' there cannot be similar hopes of unstimulated respect. And these are days, far more than in the past, when public opinion can decide the course of enterprise.

We said in 1950 that 'of the 50 million people in this country it is safe to say that many fewer than half a million have any conception of the size, nature, or importance of the British chemical industry.' The Association of British Chemical Manufacturers has displayed some awareness of this though no truly full-blooded public relations plans have yet been launched; collectively the in-

dustry seems only partially convinced that it is worth letting the ordinary public know more about its work and national contributions. Even the individual efforts of some of our large and progressive chemical companies seem to lack persistence and continuity.

In some circles today public relations work is looked upon with economic suspicion. The hard-headed businessman likes to invest cash in something more tangible. The tendency is to do nothing about it until genuine hardship due to the lack of public understanding has been experienced. Inasmuch as the absence rather than presence of public relations work is easier to measure, this may appear to be sound sense; but few would call it wise to wait until a serious fire has been experienced before taking out insurance. The analogy is not unduly forced. The U.S. Manufacturing Chemists' Association has initiated its new public relations programme with a commendable realism. It has no intention of investing money in the unknown and immeasurable. The first step has been appropriately 'chemical'—a sample has been taken and analysed. It is easy to aim at telling the public more about the chemical industry, but it is prudent to ascertain first of all what the public already knows and thinks. A public opinion research organisation was com-

missioned to conduct a poll and the following are some of the indications.

The public generally appears to 'think well' of the industry, respecting it particularly for its pioneering activities and for new product development. It was placed first among seven major industries—which included aircraft and car manufacture—for 'doing most to develop new and better products' by 38 per cent of the poll. The average person appreciates that the industry significantly helps in building better standards of living and would advise a young friend to get into a chemical industry job. Also, and this will be received with surprise, the average person has a favourable attitude towards 'synthetics', believes that they are often superior to natural products, and certainly has no prejudiced resistance to them. This reaction might not be so readily observed in Britain.

These results might suggest that public relations have looked after themselves quite effectively. But there were other findings. The chemical industry was much less known than other large industries. Only 4 per cent of the poll claimed to know a good deal about the chemical industry although for the car, steel, and aircraft industries the figures were 31 per cent, 12 per cent and 9 per cent. A majority regarded the chemical industry as the most dangerous and unhealthy to work in—fear of explosions, fumes and gases was deep-rooted. Many people would oppose or dislike the setting-up of a chemical works in their

district; and of those who appeared to be more tolerant, most based their attitude upon economic benefits alone. Only one person in three believed that there was much competition in the industry; over 35 per cent believed that two or three companies shared most of the business. And more than 50 per cent were critical about the assumed lack of competition or else were uninformed to the contrary. Three out of four felt that the industry's activities required close regulation.

It should not be argued that a similar poll of opinion here would show that the public pulse has the same beat. (For what it is worth, our guess is that results would in fact be less digestible!) But this one effort that has so far been made to find out what ordinary people know and think about the industry as a whole emphatically indicates that much more information should be made available. The U.S. Manufacturing Chemists' Association has now drawn up a long-term programme that includes an official information service, the preparation of 'facts books' for popular reference on the industry, a public speakers' bureau to provide or assist speakers and to publicise speeches that are made, and an educational branch to explain the industry to youth. In the light of the opinion poll findings, this would seem to be a practical and certainly far from intangible approach. By comparison, the British chemical industry is collectively doing nothing, relying upon the mere hope that the public will somehow hear about its virtues.

## On Other Pages

<i>Alkali Inspectors' Problems</i>	109
<i>A Review of Phenol Analysis (Part IIIB)</i>	113
<i>Industrial Applications of Ion-Exchange Resins</i>	117
<i>Birmingham Symposium</i>	120
<i>Staveley Compensation Claims</i>	121
<i>Weed-Killing Trials</i>	122
<i>Kellogg Expand Plant</i>	123
<i>Sulphur Allocations</i>	124

<i>Chemists' Bookshelf</i>	125
<i>Fertiliser Output</i>	126
<i>Personal</i>	127
<i>Home News Items</i>	128
<i>Overseas News Items</i>	129
<i>Publications and Announcements</i>	130
<i>British Chemical Prices</i>	131
<i>Chemical and Allied Stocks and Shares</i>	136
<i>Law and Company News</i>	138

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## Notes & Comments

### Great Memories

MOST chemists have already noted that 1952 is the centenary year of Sir William Ramsay's birth—certainly all who have spent student or post-graduate years in the great training-school of University College, London, will have been well aware of it. Yet, so far, little has been written about Ramsay's life and work; so great a British chemist might have been more spaciouly remembered. Fortunately one of Ramsay's closest co-workers, Professor Morris Travers, is still with us and he provides a delightfully intimate sketch of Ramsay's career in the latest issue of *Endeavour* (11, 43, 1952, July). Once again we see the remarkable pattern of Victorian youth and scientific ambition with Ramsay at 16½ educated in classics but untaught in science, not deciding to become a chemist until he had finished a 3-year university course. Like Gowland Hopkins who discovered vitamins, the discoverer of the rare gas elements began his chemical career by entering a busy analytical laboratory as apprentice and with little more to guide him than a post-adolescent enthusiasm for chemistry.

### His Life All too Brief

AT 28 Ramsay was a professor of chemistry at the (then) University College of Bristol; before he was 30 he was both professor and principal. At 35 he was appointed to the Chair at University College, London, successor to Williamson. There the re-building of a research school in chemistry had to be faced, for Williamson had let its initial progress fade into decline. Ramsay at 40 had established himself as one of the outstanding chemists in Europe and it was at this critical point, in his career that he grasped the 'rare gas' opportunity, which began, as more than a few great scientific events have begun, in the correspondence columns of *Nature*, in which a letter from Lord Rayleigh drew attention to the fact that atmospheric nitrogen always had a higher density than

chemical nitrogen. Ramsay accepted the challenge of this problem, checked that the mysterious fact was true, and wrote in a letter to Rayleigh, 'Has it occurred to you that there is room for gaseous elements at the end of the first column of the Periodic Table?' The rest is better known—argon, neon, helium, krypton, and xenon, all discovered and classified by 1900, and later, within ten years, the association of helium with radio-active elements was to be made known, a vital stepping-stone in the journey towards understanding atomic structure. It was Ramsay who first suggested that a chemical bond might be explained as a mobile electron. But at 64, after 20 years of inspired research, Ramsay was dead—the flowering of his genius had been all too brief. How much more might have been associated with his name had he lived ten years longer cannot be estimated.

### New Approach to Cancer?

D.R. SCOTT and co-workers at the University of California have isolated a chemical substance from cancerous growths that may be a leading agent in the development of cancer. The presence of this substance is believed to enlarge the blood vessels that directly supply growths; one measured property is the anti-clotting power of the substance—it increases the clotting time of blood from four minutes to as much as half an hour. If such a substance is self-produced by malignant growths, it could explain how their development robs the normal tissues of nourishment. The nature of the substance is so far undetermined. It is probably part of a protein molecule and appears to have some relationship with the hormone of the adrenal gland. Identification, when achieved, may well lead to a great advance in the battle against cancer, for it might be possible to design chemico-therapeutic treatments that suppress the formation or translocation of this malignant substance. However, this is a research field in which several doors have seemed hopelessly ajar before.

## Long Ashton Research

ONCE again the impressive annual report of Long Ashton (University of Bristol) agricultural and horticultural research station has appeared. It is particularly pleasing to see that new world developments in technique have been tested under British conditions. Thus, one paper describes the use of 1 per cent urea solutions as nutrient sprays for apple trees; though further work must be awaited, it is already shown that the nitrogen status of the foliage is effectively increased by this relatively new method of major nutrient application. Another paper reports initial experiments using the growth-inhibiting substance, maleic hydrazide; the ripening of berry fruits has been considerably retarded, but there would appear to be no similar effects upon flowering. Nevertheless, the use of maleic hydrazide is not recommended—since it is a chromosome-breaking substance, it may also be carcinogenic.

## Grave Doubts Raised

THOUGH not discussed in any detail, an important Long Ashton finding is in the field of systemic insecticides; it has been shown that Schrader's rate of breakdown inside the plant can vary according to plant species. Radio-P tracer work has revealed a faster rate of breakdown in beans than

in coleus or chrysanthemums. Here there would seem to be serious divergence from previously reported research, which has led to the general conclusion that rate of breakdown is independent of plant species. Since it is only through metabolic breakdown of the molecule within the plant that the toxicity (to humans) of the insecticide disappears, this is an extremely vital issue and it cannot be left in doubt. If, indeed, the rate varies for this or that species, we cannot feel at all sure that this type of organo-phosphorus insecticide is 'safe' after a standard period—instead, a vast amount of research work will be required before 'safety conditions' can be laid down for different crops. Workers in this new subject will undoubtedly await the more detailed presentation of this Long Ashton work with some concern. There cannot be any uncertainty about the fate of toxic substances applied to food crops as systemic insecticides.

## New Company Formed

Vacuum Oil Company's plans for erecting a 250,000,000 gallons-a-year catalytic cracking refinery at Altona, just outside Melbourne, have been advanced with the formation of a new company, Standard Vacuum Refining, with an authorised capital of £A15,000,000. Products will include aviation jet fuel for commercial and Service jet aircraft.



*On Monday, 7 July, a very large adsorber vessel of stainless steel left Rochester, Kent, for the Midlands under police escort, and our photograph shows it passing Marble Arch, London. The vessel, one of three, was designed by the British Ceca Company Ltd., for a large-scale acetone recovery plant in the Midlands said to be the largest automatic unit of its type in Europe. The outfit measured some 50 feet long, 15 feet wide and 15 feet high on its cradle*

## Problems of Alkali Inspectors

### Need to Increase Inspections of Registered Works

**A** DECLINE in the average number of visits to registered works from four annually in pre-war years to three in 1951, and the necessity for arresting this decrease is emphasised by the Chief Inspector in the 88th Report on Alkali, &c., Works covering the year 1951 (HMSO, 2s. net).

Works registered under the act in 1951 numbered 971, involving the operation of 1,773 separate processes. This showed a net decrease of six works and two processes compared with the previous year.

The total number of visits paid during 1951 was 3,531 including 209 special visits by the Chief Inspector (W. A. Damon) or his deputy, Dr. J. S. Carter. Of these visits 283 were to, or in connection with, works not registered under the Alkali Act, and a further 95 were to spoilbanks. During the inspections 1,976 quantitative analyses were made of gases emitted from the processes in operation. Samples were also drawn and submitted to the Government Laboratory for detailed examination.

In the past few years, many small works have been closed and the processes transferred to larger works. The trend is reflected in the reduced number of registered works in spite of new registrations necessitated by Alkali Orders.

#### Works Becoming Bigger

Registered works are becoming bigger and more complex with a tendency to locate them in less populated districts. This has led to more travelling time being involved and also means that inspection of individual works takes longer.

Non-routine visits to unregistered works require particular treatment, and although only 10 per cent of the total visits, occupied substantially more than that proportion of the inspectors' time.

It is considered essential that the annual visits to registered works should be restored to the pre-war figure and this can only be achieved either by the appointment of an additional inspector, or by curtailing quite severely the attention given to non-registrable processes.

The Act is specific in its provisions relating to escapes from alkali, sulphuric acid

(lead chamber and concentration processes), and muriatic acid works, requiring that they should not exceed certain stated concentrations of acid gases. So far as other scheduled works are concerned, the requirement is merely that best practicable means should be furnished and used efficiently and continuously, whereby noxious or offensive gases may be either eliminated or rendered harmless and inoffensive. There is, therefore, in the latter cases no well-defined dividing line between legal and illegal operation and a decision as to whether a given set of conditions shall or shall not be treated as constituting an infraction rests, to a great extent, with the District Inspector.

#### Sixty Infractions

Infractions (60 in all) had been recorded in formal letters to the owners of the works concerned. A number of 'near-infractions' had also been noted, when it had been thought sufficient to make strong verbal comment on the condition of plant, lack of proper supervision, and so on.

As suitable action was taken and assurances were given in every instance no legal proceedings were taken.

Some of the visits to unregistered works were to inquire as to registrability or otherwise; others had been by request to assess the likelihood of offence arising through the operation of new processes but, unfortunately, the greater number had been as a result of complaints that had already been made. Prevention is not only better than cure but, as a rule, it is also easier.

It is doubly desirable, therefore, that consideration of ways and means and the provision of necessary safeguards should be undertaken before a new process is put into operation.

Three visits were made to Battersea Power Station for the purpose of assessing the extent and efficiency of gas washing for the removal of sulphur oxides from the waste boiler gases. Maintenance and other engineering difficulties obviously impaired both the extent and the efficiency of gas washing during 1951.

Over the whole period November, 1950, to November, 1951, inclusive (that is 13



months), waste gas arising from 59 per cent of the coal burned was subjected to gas washing. The washed gases retained 15 per cent of the sulphur originally present in the coal. The overall removal of sulphur from all the coal burned was therefore 50 per cent. The corresponding figure over the preceding 11 months was 45 per cent.

As was forecast in the last report (THE CHEMICAL AGE, 65, 113), a close study had been made of the metallurgical aspects of the use of fluorspar and had shown that consumption could be reduced by an average of 28 per cent. Moreover, attention to details of the technique employed had indicated the possibility of reducing the production of volatile fluorine compounds.

### Chlorinated Phenols

Chlorine derivatives of phenol and its homologues had a persistent and penetrating odour which was noticeable in even minute concentration. Great care was therefore necessary in their manufacture and use. Where gas containing these compounds could be conveniently collected, thorough scrubbing with caustic soda was effective.

Among the registered works the average weighted efficiency of condensation at all alkali works—calculated on the same basis as in previous years—was 95.8 per cent. The Alkali Act requires a minimum condensation of 95 per cent. Tests made by the District Inspectors throughout the year showed an average escape of 0.094 grain HCl per cu. ft.

Production of sulphuric acid in 1951 was 147,000 tons less than in the previous year but the proportion made in chamber plants remained the same. The shortage of brimstone was reflected in the reduced consumption of this material by 66,000 tons. There had also been a slight reduction in the consumption of zinc ore (due to difficulties in the shipment of ores to this country) and of anhydrite but the deficiency had been in part offset by a greater consumption of spent oxide and pyrites. In the early part of the year there was a serious shortage of sulphuric acid but the position was soon restored by economies in the use of acid, the recovery and re-use of 'spent' acids and the importation of acid from the continent.

Schemes for the recovery of acid from pickle liquor produced at steel works had received much attention and a process had been worked out which gave promising results on a laboratory scale and which it

was now proposed to develop in a pilot plant. By way of augmenting sulphur supplies, attention had also been redirected to the possibility of extracting sulphur from spent oxide. Carbon bisulphide had been used for the purpose but it extracted tar as well as sulphur and the product was therefore contaminated to an extent proportional to the tar content of the spent oxide.

Recent research had shown the possibility of recovering substantially pure sulphur from spent oxide, even if the latter was fairly high in tar content. The envisaged process involved extraction by toluene at elevated temperature followed by controlled crystallisation and subsequent fusion of the sulphur crystals.

Difficulty and delay in obtaining material and labour for necessary repairs had resulted in some deterioration of maintenance standards. At some sulphuric acid plants production had been temporarily reduced or even stopped as a result.

Eight new contact process sulphuric acid plants were in the course of erection and five others were contemplated. Raw materials likely to be used as a source of sulphur would be:—anhydrite on four plants; pyrites-flash roasting on five; pyrites-mechanical roasting on two; H<sub>2</sub>S and acid sludge, one; and sulphur, one.

### Superphosphate Falling Off

Demand for superphosphate was normal in the first half of the year but with rising prices towards the autumn there was a considerable falling off and some factories, which had been unable to make enough superphosphate, reverted to a low rate of production.

During the year a plant for production of triple superphosphate was put to work. Escapes from this and the phosphoric acid plant had been satisfactory.

Of the 74 works registered under nitric acid works only three were actual producers of nitric acid: the remainder were operating manufacturing processes from which oxides of nitrogen were evolved.

Nitric acid production was now entirely via the oxidation of ammonia, the old method of decomposing nitrate of soda having been completely abandoned. Ammonia oxidation plants had operated efficiently; there was, however, a discharge of coloured and somewhat heavy looking tail gas which was apt to cause complaint although the acid



content was relatively low. Increased production had resulted in a slightly greater acidity of tail gases during the past year in spite of improved absorbers. Absorption space required to treat tail gases varied inversely with the acidity and there was therefore an economic limit to the capacity that could be provided.

A further decrease in the number of registered sulphate of ammonia works reflected the tendency to centralise production in fewer but larger plants. With only three exceptions, operations had been reasonably satisfactory with adequate provision for the avoidance of escapes and the proper treatment of foul gases.

The scale on which chlorine was made and used had markedly increased. The supply was barely up to the demand and there had been shortages from time to time.

An explosion in a chlorine liquefier caused no personal injuries but resulted in an appreciable escape of gas to air. Precautions had been taken against a recurrence. Another escape of chlorine occurred at the same works later in the year when failure of electrical equipment interrupted the flow of caustic soda to the tower of a hypochlorite unit. The escape was not noted for some minutes: provision of an alarm was under consideration.

Sulphide works include all those processes where hydrogen sulphide is evolved as part of a chemical process. This portion of the report therefore dealt with 110 registrations covering operations of a widely diverse nature with hydrogen sulphide emissions varying from almost pure gas to concentrations to be recorded in parts per million. Moreover emissions are at times contaminated with organic compounds. The aim was the complete elimination of hydrogen sulphide: failing this, to reduce it to a concentration of a few parts per million.

### Sulphur Dioxide Emission

Waste process gases from the manufacture of carbon bisulphide consisting essentially of uncondensed carbon bisulphide vapour and hydrogen sulphide, could be dealt with in a reasonably satisfactory manner. An equally or perhaps more serious problem, however, related to emission of sulphur dioxide in a concentrated state and at relatively low level during the operation of charging the individual retorts. There was little doubt that such emissions were a

major factor in the complaints made against a large works where there was also appreciable production of sulphuric acid. The problem was a difficult one, but recent trials of a prototype charging valve of special design were promising and more had been ordered.

Last year's report dealt at some length with the increasing oil refining capacity of the country, the generalities of the fume emission problem and of the measures which were in hand to minimise the effect on local amenities of this enormous expansion. Discussions had continued, but these related now for the most part to matters of detail.

The question of discharging waste gases containing sulphur dioxide had been settled by securing that chimneys should be of from 100 ft. to 300 ft. in height depending on the mass rate of emission of sulphur oxides.

### 'Bisulphite Processes'

Extension of the definition under the 1950 Order to include processes (not being smelting processes as already defined) in which oxides of sulphur were evolved had rendered the term 'Bisulphite' something of a misnomer as a large variety of chemical operations were now included under this head. The new definition was a wide one and was being interpreted with discretion so as to avoid the unnecessary registration of processes where the evolution of sulphur oxides was so small that no especial means were required to deal with it.

Reasonably satisfactory progress was being made in dealing with emissions from works which had become registrable under the Order, but certain major problems, such as that of the emissions from the manufacture of ultramarine, were still unsolved in spite of considerable investigation, which was being continued.

There had again been a further fall in the number of tar works registered, namely, 155, compared with 162 in 1950, 175 in 1949, 269 in 1939 and 326 in 1931. The fall was due to the continuing tendency to concentrate distillation at large central installations. It was not due to a reduction in the amount of tar distilled: actually, half as many works were coping with 50 per cent more tar than in 1931.

Replacement of intermittent pot stills by continuous distillation units had continued. The latter method possessed many practical

and economic advantages, not the least of which, from the atmospheric pollution viewpoint, was the uniform rate of foul gas evolution which was thereby more readily dealt with in an efficient manner.

In the latter part of the year it was decided for a number of reasons, to operate the retorts in zinc works at a slower rate (that is, a longer distillation cycle) when it became obvious that the overall emission of zinc fume was greatly reduced. For the first few hours after charging emission was still somewhat heavy, but it fell off rapidly thereafter and a careful balance indicated that the total loss of zinc to the atmosphere was not more than a quarter of what it had been previously. In other ways, too, the efficiency of zinc recovery was improved, thus offsetting certain unavoidable decreases in overhead charges, which were incurred by running the retorts on a longer cycle.

While the improvement brought about by the adoption of a longer distillation time was appreciated, the emission of zinc fume was still substantial and the ultimate solution must lie in the replacement of the existing horizontal retorts by a better system.

#### Fall in Benzene Works

There had been another fall in the number of benzene works, the total of 381 in 1951 comparing with 399 in the previous year, 486 in the peak year of 1945, and 311 in 1938. Many plants at gas works were now used largely for the removal of naphthalene from coal gas; others had been idle for some years although they had been maintained in reasonably good order and could be restarted at short notice.

During the year, 138 samples of escapes containing lead fume were drawn and examined at the Government Laboratory. Although the scale of sampling was smaller than in 1950, the major potential offenders in regular operation (the big blast furnaces, reverberatory furnaces and the like) with a total emission greater than 25,000 cu. ft. per minute and all the unsatisfactory cases (fortunately all small units) had been included in the survey.

The variable nature of the acid sludges produced in the refining of hydrocarbon oils in the petroleum and coal tar industries renders the problem of their treatment one of some difficulty, and most of the larger refineries are faced with serious problems in dealing with this waste material. The

sludges vary from mobile liquids to highly viscous sludges and no single method of treatment is universally applicable. Methods of disposal (apart from dumping) fall under three heads (1) by burning, (2) by hydrolysis and (3) by thermal decomposition to produce sulphur dioxide which may, in turn, be used for production of sulphuric acid. This third method is not as yet in use in this country, although it is under consideration.

Burning of sludge even when described as 'thermal recovery' is to be deplored as not only does it result in appreciable discharge of sulphur oxides to air, but it seems wrong in these days thus to waste potential acid. If recourse had to be made to burning—and it might be with certain sludges that such was the only practicable technique at the moment—this should at least be done properly. There should be complete combustion, freedom from escapes at low level and the final discharge should be at a high level.

An especially important factor was the mass rate of sulphur dioxide emission and chimney heights should be such that there would be little risk of serious atmospheric contamination at ground level. Burning under unsuitable conditions had already given rise to complaint.

In Scotland, 74 works were on the statutory register according to the report for 1951 of the Chief Inspector for Scotland (E. A. Balfour Birse). During the course of the year 213 visits were made to works on the statutory register and 118 chemical analyses were carried out. In addition, 171 visits were made to other premises on work not immediately within the ambit of the Acts.

#### Only Six Infringements

Only six infringements of the provisions of the Act of 1906 were found during inspections and these were all expeditiously rectified by the works concerned.

As forecast in the report for 1950, a shortage of sulphur had an adverse effect on the production of the chemical industry in Scotland during the year. Production of sulphuric acid was most affected, being only about three-quarters of that in 1950.

In lines not so dependent on sulphur, however, the industry appeared to remain as active as in recent years. Indeed, with the opening of the new production units at Grangemouth for chemicals from petroleum, the industry had expanded considerably when considered as a whole.

# A Review of Phenol Analysis

## Part IIIa—Quantitative : General (ii)

IN the last part of this review (see THE CHEMICAL AGE, 67, 89-93), general quantitative methods were discussed. These included colorimetric and titrimetric procedures. This section will be mainly on gravimetric and physico-chemical methods.

Stodola<sup>27</sup> has proposed one other indirect titrimetric method for the microdetermination of hydroxyl groups in organic compounds. An acetylating mixture consisting of pure acetic anhydride mixed with four volumes of pyridine is prepared and a blank determination first made on 70-120 mg. of the mixture by heating it under reflux for 1 hour at 95°-100°C. After the heating, the solution is titrated with 0.02N sodium hydroxide in alcohol. From the blank, the number of mls. of acetic acid furnished by 1 mg. of the acetylating mixture is found. From 5-20 mg. of the sample is then heated with at least twice the theoretical quantity of the acetylating mixture, and another titration effected with sodium hydroxide.

(c) *Gravimetric Methods*: Very few new gravimetric procedures have been proposed in recent years for the determination of phenols. Sage and Fleck<sup>28</sup> determined *o*- and *m*-cresols in mixtures of cresols as follows:—Take 3-4 g. of cresol mixture in a 50 ml. measuring flask and make up to the mark with 10 per cent aqueous sodium hydroxide. Mix and take two 10 ml. portions for duplicate analysis. Pipette the portion into a 100 ml. Erlenmeyer flask, add 5 ml. of water and 5 ml. of formalin. Heat for 5 minutes on a boiling water-bath, cool, add 20 ml. of concentrated hydrochloric acid, shake vigorously, and cool. After 2 hours, filter through a weighed Gooch crucible. Wash free from chloride with cold water, dry for 1 hour at 98-100°C. and then allow to stand over concentrated sulphuric acid before weighing. The weight of resin  $\times 0.752$  gives the weight of *o*- and *m*-cresols in the mixture. Subtract from this the weight of *o*-cresol found by the freezing-point method using cineole.

### Thermal Determination

Thymol forms an insoluble compound with mercury and Bordeianu<sup>29</sup> used this as the basis of a method for the determination of thymol. By treating about 0.1 g. of thymol

with a weighed portion of about 0.5 g. of mercuric oxide dissolved in 1.5 ml. of acetic acid, the insoluble di-mercurithymol compound is formed at room temperature. The compound can either be weighed, or the excess mercury in the filtrate can be titrated with thiocyanate. Results are claimed to be accurate to within about 0.5 per cent of the actual thymol content.

(d) *Physico-Chemical Methods*: Freezing-point methods appear to be the most popular in this branch of phenol analysis and several of the more promising may be detailed. Phenol, the three cresols and their homologues possess very close chemical characteristics and also a close degree of approximation in their physical properties. This greatly narrows the opportunity of providing a satisfactory method for determining the various components of phenol mixtures. Dawson and Mountford<sup>30</sup> purified phenol and the three cresols by distillation and crystallisation, and transferred the pure compounds to well-stoppered bottles. Freezing-point determinations were then made on mixtures of the pure compounds, the data below representing the results of observations of the lowest temperatures at which complete liquefaction occurred.

### Curve Indications

The freezing-point curves for mixtures of phenol and *o*-cresol appear to consist of two branches corresponding to two series of mixed crystals. There is no clear evidence of compound formation. The curve for mixtures of phenol and *m*-cresol shows clearly the formation of a compound containing 1 molecule of phenol in combination with 2 molecules of *m*-cresol and likely to be very considerably dissociated in the liquid state. its melting-point is 25.9°C. and the eutectic mixtures of this binary system correspond with 44.8 per cent and 95.2 per cent of *m*-cresol, the corresponding temperatures being 20.2° and 7.3°. The curve system of phenol and *p*-cresol indicates the formation of a compound which crystallises at low temperatures from a limited range of mixtures containing phenol in excess. Mixtures of *o*- and *m*-cresol form a compound in which two molecules of *o*-cresol and one molecu-

of *m*-cresol are combined. With *o*- and *p*-cresol a compound is formed which contains one molecule of *o*-cresol and two molecules of *p*-cresol. With *m*- and *p*-cresol a compound is formed containing two molecules of *m*-cresol and one molecule of *p*-cresol, the freezing-point of phenol produced by the addition of *m*- and *p*-cresol falling continuously as the proportion of *p*-isomeride in the mixed cresol increases. When *o*-, *m*- and *p*-cresol are added in equal proportions to phenol, the change in freezing-point is slightly greater than that produced by *o*-cresol in the same quantity. The freezing-point of *o*-cresol is lowered most by *p*-cresol, slightly less by *m*-cresol, and much less by phenol. The freezing-point of *m*-cresol is lowered more by *p*- than by *o*-cresol, and the freezing-point of *p*-cresol is lowered nearly equally by the other three.

#### Freezing Point Methods

Having established these facts, Dawson and Mountford<sup>27a</sup> presented freezing-point methods for the determination of phenols and the three isomeric cresols in mixtures of these substances:—

(a) *Phenol and o-cresol*: If the mixture contains phenol or *o*-cresol in considerable excess ( $1.050 > d_4^{25} > 1.061$ ), the composition may be deduced directly from the freezing-point of the mixture X, the phenol branch being used for the mixtures of higher density, and the *o*-cresol branch for those falling within the lower range. If the density lies between the above limits, X should be mixed with a known proportion of standard phenol (M.P. 40.5°), so as to raise the density of the resulting mixture Y above 1.061. The freezing-point of Y is then measured. Assuming that A parts of X are mixed with 100-A parts of phenol and that this mixture, Y, contains, according to the freezing-point measurement, y per cent of phenol, then the percentage of phenol in X is given by:

$$(y - 100 + A) 100/A.$$

(b) *m-Cresol and p-cresol*: The *p*-cresol curve is adapted for use in the determination of *p*-cresol in mixtures of *m*- and *p*-cresols. The ratio (1:2) of the mixture to pure *p*-cresol is most convenient. Knowing the freezing-point, the percentage of *p*-cresol may be read from the curve.

(c) *o-, m- and p-Cresol*: The method depends on the fact that equal weights of *o*- and *m*-cresol depress the freezing-point to

the same extent, and on the further fact that equal weights of *m*- and *p*-cresol depress the freezing-point of *o*-cresol to nearly the same extent. In the application of the method, the unknown mixture X is mixed with a known quantity of *p*-cresol giving a mixture, Y, the freezing-point of which is determined. From this the percentage of *p*-cresol in Y, and hence in X, can be obtained from the freezing-point curve. Similarly, X is mixed with a known proportion of pure *o*-cresol, giving a mixture, Z, the freezing-point of which is also measured. From this the percentage of *o*-cresol in Z, and hence in X, may be derived from the freezing-points recorded, which correspond with the freezing-point curve lying between the curves representing the changes produced in the freezing-point of *o*-cresol on the addition of *m*- and *p*-cresol respectively.

(d) *Phenol, o-, m- and p-cresol*: The quaternary mixture X is mixed with about half its weight of *o*-cresol. This mixture Y is then submitted to slow fractional distillation, and by this means Y is separated into two fractions, one of which (A) consists of a mixture of phenol and *o*-cresol, and the other (B) of a mixture of *o*-, *m*- and *p*-cresol. The fractions A and B are then analysed by application of the above freezing-point methods.

#### Modified Procedure

Quist<sup>27b</sup> successfully determined *m*-cresol in crude cresol using a modified Raschig procedure, which depends on the formation of trinitro-*m*-cresol. Mixtures of picric acid and trinitro-*m*-cresol with less than 25 per cent or more than 75 per cent picric acid show distinct freezing-points, and a curve can be drawn to show the content from the freezing-point. The content of *m*-cresol in phenol-rich cresols can be determined by diluting the nitration product of picric acid and trinitro-*m*-cresol until all the former is dissolved. Then, by allowing for the solubility of the latter in the water used, it is possible to compute the *m*-cresol from the amount of undissolved trinitro product.

Cineole and *o*-cresol form a crystalline compound of definite melting point which has been used for determining cineole in eucalyptus oils. Potter and Williams<sup>28</sup> have described a method for the determination of *o*-cresol using the reverse process. A weighed amount of the sample is mixed with a weighed sample of pure cineole and the

freezing-point determined. By comparison with an empirical curve the percentage of *o*-cresol present is found from this freezing-point.

Seamen, Norton and Foley<sup>30</sup> determined *o*-cresol in phenol by a cloud-point method with mixtures of phenol and *o*-cresol containing up to 5.6 per cent of the latter and mixtures containing 65 parts by weight of water to 35 parts by weight of phenol/*o*-cresol, each addition of *o*-cresol increases the cloud-point to an extent that can be expressed by two linear equations, one for concentrations up to 3 per cent *o*-cresol and the other for 3-5.6 per cent *o*-cresol.

#### Cloud-Point Procedure

The method is as follows: Take 7-8 g. of the sample in a dry, weighed test-tube, add 1.857 times as much water, and place in a water-bath at 75°-80°C. Mix until the mixture is clear. Centre the tube by means of cork in a large test-tube, which serves as an air-jacket. Insert a thermometer, which reads to 0.1°C., and stir at a definite rate. As the solution cools, a turbidity starts to form at 1°-2° before the cloud-point. Finally, there is an abrupt change in opacity, which is taken as the cloud-point, and then the temperature is read to the nearest 0.05°. For cloud-points up to 70.25°C.,

$$\% \text{ } o\text{-cresol} = \text{cloud-point} - 66.40/1.326.$$

$$\text{For cloud-points from } 70.25^{\circ}\text{-}73.5^{\circ}\text{C.,}$$

$$\% \text{ } o\text{-cresol} = \text{cloud-point} - 66.81/1.1167.$$

The results are claimed to be within 0.07-0.09 of the actual value. Another turbidity method is due to Shaw<sup>31</sup>. For the determination of phenol he devised a special, but easily made, apparatus, and steam-distilled a 10 ml. sample to give 25 ml. of distillate. The distillate is divided into portions, diluted until the concentration lies between 30 and 35 parts per million, brought to 20°C., bromine-water added, the mixture shaken, and the turbidity immediately compared with that in 30 and 35 p.p.m. standards. The method is accurate and very rapid. In a later paper Shaw<sup>31</sup> modified his method to include concentrations of phenol less than 75 p.p.m.

Paris and Vial<sup>32</sup> also used a turbidity method for determining phenol in mixtures with *o*-cresol, phenol in mixtures of isomeric cresols, and cresols in binary mixtures with xylenols. Their method is somewhat similar to those of Seamen, Norton and Foley (*loc. cit.*) and Kay and Haywood<sup>33</sup>, who reported

a different cloud-point temperature for phenol and water. There are, however, two cloud-points for this mixture, either of which can be used with good precision, provided that the analyst constructs his curve on the basis of that point.

#### Viscosity Measurements

Viscosity measurements have been made for *o*-, *m*- and *p*-cresols, as well as for binary and ternary cresol mixtures. Scheiber<sup>34</sup> used these as the bases of a method for the determination of *o*-cresol in ternary mixtures, but reported that the separation of *o*-cresol from such mixtures by fractional distillation was not possible.

The separation of phenol and cresol can be accomplished by means of the solubilities of their sodium sulphonate salts. The phenol salt is soluble in water, the cresol salts insoluble. Bettelheim<sup>35</sup> applied this solvent extraction method to the determination of both phenol and cresols in technical cresols.

Fractional precipitation methods are not common in phenol analysis. Fischer and Breuer<sup>36</sup>, however, determined small quantities of phenol in mixtures of phenols by a method based on the fact that when homologous phenols are fractionally precipitated by a restricted amount of hydrochloric acid, ordinary phenol is precipitated last in a relatively pure condition. Thus phenol was dissolved in mixed cresols and excess of alkali was added. The solution was repeatedly extracted with hydrochloric acid, followed by an ether extraction. Evaporation of the ether gave a good recovery of phenol.

#### Spectroscopic Methods

Spectroscopic methods of analysis are now extensively used in industry and are of special importance in phenol analysis. Robertson *et alii*<sup>37</sup> have quantitatively analysed isomeric cresols and cresol-phenol mixtures by an ultra-violet absorption spectroscopic technique, the samples being in the vapour phase. Using a 3 mm. grating spectrograph with a 70 cm. quartz absorption cell and a 2.5 kV hydrogen discharge tube as light source, absorption spectrograms were made for *o*-, *m*- and *p*-cresol and phenol, and for the vapour in equilibrium with synthetic mixtures of known composition at 25°C. Concentrations as low as 0.3 per cent phenol in cresol mixtures could be determined. Concentrations above 50 per cent

*o*-cresol, 70 per cent *p*-cresol, or 40 per cent phenol in cresol mixtures could be analysed by addition of known amounts of the *meta* or other isomer, to decrease the relative concentrations, or by use of another additional short cell.

Friedel, Pierce and McGovern<sup>48</sup> used an infra-red technique to determine phenols, cresols and related compounds. The instrument preferred was a Perkin-Elmer spectrograph at a wavelength of 8-10 Å.

Finally, in this general review of phenol analysis, mention may be made of several valuable papers by Dumont<sup>49</sup>, who critically examined numerous available methods for the determination of cresols. Methods involving the use of bromine or iodine are not suitable for the analysis of a mixture of the three cresols in solution. By means of bromine, however, each of the three cresols can be determined separately. By titration with bromine, it is possible to determine the *m*-cresol in a mixture of the three cresols. In any mixture of cresols, *o*-cresol can be determined colorimetrically using bromine. Other chemical methods used for the determination of phenols are not suitable for cresols. Among the physical methods steam distillation and solvent extraction procedures give good results. Raschig's method, modified by Quist (loc. cit.) is suitable for the determination of *m*-cresol in mixtures.

(To be continued)

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## Combustion Symposium

SOME 100 papers from Great Britain, France, Holland, Belgium, Germany, and Japan as well as from the research laboratories and educational institutions of the United States will be presented at the 1952 International Symposium on Combustion to be held at the Massachusetts Institute of Technology from 1-5 September. The symposium will be open to all interested in combustion and at least 50 foreign experts in the field have promised to attend.

Papers are now being reviewed by a Papers Subcommittee of the General Symposium Committee of 68 American and 12 foreign members. Emphasis is being placed on the physical aspects of combustion, particularly wave phenomena and turbulence, treated from both experimental and theoretical standpoints.

Typical fields in which papers will be presented are ignition; stabilisation in laminar and turbulent flow; limits of inflammability and detonability; instability phenomena; and microstructure of combustion waves.

All facilities of the Institute will be open to registrants for the symposium and living accommodation will be available to those who specifically request reservations in advance. Requests for registration forms or for further information on the symposium should be addressed to Summer Session Office, Attn: Combustion Symposium Committee, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

## Funds for Expansion

IT is reported from New York that Dow Chemical has sold \$100,000,000 of convertible subordinate debentures to the public. In its registration statement with the Securities and Exchange Commission, the company said that the issue, which is to mature in 1982, will be convertible into common stock. Proceeds are for use in construction of additional facilities for the manufacture of present and new products.

Capital additions to plants and properties of the company over the fiscal years 1947-52 have been about \$431,000,000, of which \$135,000,000 was spent in the fiscal year ended 31 May, 1952. The company estimates at present that about \$100,000,000 will be spent during fiscal year 1953 and also in 1954.



## Some Industrial Applications of Ion-Exchange Resins

THE phenomenon of cation-exchange between a solution and a solid exchanger has been known for more than a century, and it is nearly fifty years since this principle was first applied to water treatment. In a process developed by Gans in 1905, calcium and magnesium were removed from hard water by exchange with sodium ions, which were supplied by synthetic aluminosilicates known as permutits. The usefulness of inorganic exchanges, however, is restricted by their poor stability to acids, and for this reason no further developments of major significance took place for thirty years. In 1935, this former limitation was overcome by the discovery that synthetic resins possessed ion-exchange properties.

This vital discovery was made by two workers at the Chemical Research Laboratory of the DSIR—B. A. Adams and E. L. Holmes. The first materials they examined were resins of the phenol formaldehyde type, which contained acidic groups and were found to have cation-exchange properties. Resins containing basic groups were then prepared from *m*-phenylene diamine and formaldehyde and these proved to have anion-exchange properties. The discoveries of Adams and Holmes led to the development of improved materials and processes, which have enabled ion-exchange to be applied to a wide range of industrial problems. Some 100 different ion-exchange resins are referred to in the patent literature and there are probably about twenty different types in commercial production. An important step forward was the recent development of a method for preparing strongly basic resins, which was discovered independently in the United States and at the Chemical Research Laboratory.

### Lead by Other Countries

Having pioneered the fundamental research work in the field of organic exchangers, Britain allowed other countries to take an early lead in the application of ion-exchange resins to industrial problems. Up to the middle of the recent war progress was particularly rapid in Germany, where important applications were developed by the I. G. Farbenindustrie. About the time that

the German economy became critically restricted by wider issues, the Americans turned their attention to ion-exchange and other countries were soon left behind. During the past three or four years, however, there has been considerable research activity in the United Kingdom. So far as fundamental research is concerned, Britain is again fully abreast of any other country, but on the production side we are still a year or two behind the United States, both quantitatively and in the variety of resins produced. On the other hand, British industry has not been backward in taking advantage of the new techniques made possible by the development of exchange-resins with improved properties.

### Water Treatment Application

About 90 per cent of the total output of ion-exchange resins is used in some form of water treatment, by far the largest application being in the softening of water for industrial or domestic use. The chief advantage of synthetic resins for water softening is that they have a higher capacity than natural or inorganic exchangers, which means that regeneration is less frequently required. Hardness removal is accomplished by the absorption of calcium and magnesium cations on the sodium form of an acidic resin, the salt-regenerated Zeolite exchangers frequently being employed for this purpose.

The discovery of anion-exchange resins extended the scope for water treatment by enabling all ionic impurities to be removed. Deionisation is now regarded as potentially an even more important application than water softening. Two exchange-reactions are involved, namely the removal of cations and conversion of salts to the corresponding acids by exchange with hydrogen ions on a strongly acidic resin, followed by absorption of the free acids on a basic resin. Carbon dioxide may be removed by de-gassing the effluent from the cation-exchange bed.

The treatment of feed waters which are highly alkaline includes both hardness removal and reduction of alkalinity. A portion of the waters might be treated for hardness removal, the remainder being

passed through an acid regenerated cation exchanger. A product of any desired alkalinity could then be obtained by blending, followed by decarbonisation if required. A modification of this process uses a single bed of cation exchange resin regenerated with a suitably balanced salt mixture. The same result has also been achieved by using a single bed of a salt regenerated mixture of a strongly basic anion exchanger with a cation exchanger.

### Column Form Used

Ion-exchange resins are almost invariably used in the form of beds or columns through which solutions are allowed to percolate under gravity or slight pressure. Complete deionisation is not achieved in one cycle, and for the preparation of high quality water it may be necessary to employ two, or even three, pairs of columns in series. Water containing only a few parts per million of ionic solids is being produced by many large installations of this type, but for various purposes an even higher degree of purity is required. This can be obtained by 'mixed bed' deionisation, in which a mixture of strongly acidic and strongly basic resins is used in a single column, the effect being equivalent to that of a large number of pairs of separate columns in series. Mixed-bed deionisation is regarded as one of the most important developments in water treatment and is a British discovery made by the Permutit Company during the war. In commercial operation specific conductivities of the order of  $0.1$  to  $0.2 \times 10^{-6}$  reciprocal ohms at  $26^\circ\text{C}$ . are readily achieved. Before regeneration the two resins must be separated, but the difference in density enables this to be accomplished without difficulty.

The mixed bed technique is being employed very advantageously in both Britain and the United States to produce waters with very low silica contents for high-pressure boilers. Formerly silica had to be removed by regulated injection of a fluoride, the resultant fluosilicate being then absorbed by a weakly basic resin. The introduction of strongly basic resins and mixed beds has enabled the removal of silica to be more efficiently and economically carried out. Very pure water is also needed for the manufacture of certain chemicals, while laboratories require it for purposes of research.

Another field of application which is becoming increasingly important is in the

purification of organic compounds. A considerable number of organic chemicals have been successfully treated in the laboratory by ion exchange purification, while processes for the treatment of methanol, formalin, and glycerine have all reached the stage of commercial operation.

Technically the use of deionisation processes in the sugar refining industry is entirely feasible, but economically the benefits have proved disappointing. Because of the very small profit margin on which sugar refineries operate, any replacement of important equipment must show substantial savings to be regarded as worth-while. A higher yield of sugar can be obtained by deionisation, but this gain is largely offset by a corresponding reduction in the quantity of molasses produced. In recent years beet molasses has been used to an increasing extent in animal feeding-stuffs and its price has risen accordingly. On the other hand, certain low-grade sugar syrups and products obtained from the hydrolysis of starch are being purified by ion-exchange.

Methanol is usually contaminated with amines and ammonia to the extent of 400 p.p.m. at the start of a conversion cycle, while the normal running level is 8 to 10 p.p.m. These impurities can readily be reduced to less than 1 p.p.m. by incorporation of a single cation exchange bed in the methanol stream. A further advantage of this treatment is the removal of heavy metal ions which might be undesirable in later processes. No matter how carefully the oxidation of the starting material (methanol) is controlled, formaldehyde solutions normally contain at least 0.03 per cent of formic acid, which can be reduced to 0.002 per cent by the use of weakly basic resins.

### Another Application

Another type of application is the concentration of ionic substances from dilute solutions. By the use of ion-exchange resins useful materials present in very small quantities can be recovered from water and other solutions, purification from non-ionic substances being simultaneously carried out. The absorbed substances may then be obtained in a more concentrated solution by treating the resin with strong acids or bases. Copper, zinc and silver are all being recovered from dilute solutions. Streptomycin is concentrated and purified by absorption on the sodium form of a carboxylic acid resin.



from which it is recovered by treatment with dilute hydrochloric acid.

In the United States excess iron is being removed from phosphoric acid in pickling baths by exchange with the hydrogen form of a sulphonated polystyrene resin.

Ion-exchange is also being used industrially on a small scale to reduce the amount of calcium in cows' milk. The treated milks are reported to be more amenable to processes involving dehydration and their value in the preparation of ice cream is said to be considerably enhanced. In the United States considerable publicity has been accorded to certain medical applications, such as the use of weakly basic acids to relieve acidosis. Acidic resins in the form of salts are being administered to patients suffering from oedema and other complaints caused by sodium retention, the basis of the treatment being that the sodium is absorbed by the resin and thus excreted. Both strongly acidic and strongly basic resins have found small-scale applications as catalysts.

#### Valuable Tool for Research

Ion-chromatography has become a very valuable tool for research and is widely used in laboratories for the separation of ionic materials. Among the most spectacular applications is the complete separation of the rare earths and their preparation on the gram scale by a group of workers for the United States Atomic Energy Commission. Another notable achievement is the separation of amino-acids at the Low Temperature Research Station, Cambridge.

Despite the progress achieved our knowledge of ion exchange is still far from complete. We have yet to find out precisely why resins behave as they do and exactly what takes place during the very complex reactions which occur in beds and columns. Much research is being devoted to the development of resins with improved properties such as greater chemical, physical or mechanical strength, and higher capacity. The behaviour of a given type of ion-exchange resin depends to a considerable extent on the degree of cross-linking of the polymeric framework. For reactions controlled by particle-diffusion the exchange-rates decrease with increase in cross-linking, but an increase in the degree of cross-linking produces more highly selective resins. In the preparation of resins for general use

some compromise is therefore necessary, but in both Britain and the United States attempts are being made to produce more highly selective resins tailor-made to the requirements of specific applications. Efforts are also being made to extend the applications of resins to non-aqueous systems.

Hitherto all commercial applications have been confined to batch operation, but there is a need for a continuous system in which essentially counter-current flow is obtained in exhaustion and regeneration columns. Attempts are being made to devise a system for continuously operating equipment, and this is a direction in which significant developments are taking place, although the stage of industrial application has not yet been reached.

## German Works Bought

### U.S. Firm Acquires Pigments Plant

A UNITED States firm, the National Lead Co., has bought outright the Titangesellschaft m.b.h. chemical works in Leverkusen, Germany, claimed to be the largest works of its type in Europe.

National Lead owned a 50 per cent interest in the works and has just completed negotiations which have been going on since the end of the war to buy the remaining interest from I.G. Farbenindustrie.

The German works makes titanium oxide pigments and is expected to turn out sufficient to cover all Western European requirements. Its raw material, ilmenite ore, will come from the National Lead mine in Norway. Sales will be handled by National Lead's subsidiaries in Norway, France, Belgium and Holland.

The Titangesellschaft works, built in 1928, were severely damaged in 1944 during a heavy daylight raid by 40 R.A.F. bombers, when 26 bombs demolished some buildings and damaged all of them. The works was then completely shut down and resumed operations late in 1945.

Since then, repairs and new equipment have trebled the plant's capacity in comparison with pre-war figures. Efficiency has been increased by the installation of modern equipment.

Before the war, production costs at Leverkusen were among the lowest in Europe. The works stand in the Ruhr district.—B.U.P.

## Birmingham Symposium

### Eight Foreign Authors to Speak

THE programme of papers which will be presented at the symposium on analytical chemistry to be held at Birmingham University on 11-12 September under the auspices of the Midlands Society for Analytical Chemistry has been arranged. In all, 16 papers will be presented and eight of these will be by foreign authors. The full programme is as follows:—M. Kapel—Birmingham University: 'Some Factors Influencing the Solubility of Amine Sulphates'; J. E. B. Randles—Birmingham University: 'Rate Control of Electrode Reactions in Analytical Chemistry'; R. Gauguin—Paris: 'Use of Polarisation Curves in the Study of Some Electrochemical Methods of Analysis'; J. Heyrovsky—Prague: 'Qualitative Analysis with Oscilloscopic Polarography'; P. W. West—Louisiana State College: 'High Frequency Titrations (Oscillometry)'; R. A. Johnson—Illinois University: 'Solid Phase Nucleation and Analytical Chemistry'; J. W. Robinson—Birmingham University: 'X-ray and Electron Microscopic Examination of Potassium Cobaltinitrite Precipitates'; R. J. Winterton—Coventry Technical College: 'A Study of Three Suggested Reagents for the Detection of Potassium'; Fritz Feigl—Rio de Janeiro: 'Some New Applications of Fluorescence Reactions with Morin'; D. Gibbons—Birmingham University: 'New Reagent for the Precipitation of Sulphate'; J. Gillis—Ghent University: 'The Sensitivity of Analytical Reactions and Some New Organic Reagents'; J. Unterzaucher—Leverkusen: 'Some Observations on the Direct Determination of Oxygen in Organic Compounds'; T. S. West—Birmingham University: 'A New Titrimetric Reagent for the Determination of Water'; F. Burriel-Martí—Madrid University: 'The Enhancing of the Reducing Power of Mercury in the Presence of Thiocyanate and Cyanide—Its Analytical Applications'; R. L. Mitchell—Macaulay Institute: 'Developments in Spectrochemical Methods'; P. Hersch—Mond Nickel Co.: 'Electrochemical Methods of Gas Analysis.'

The registration fee is 10s. Accommodation at Grade I hotels is 30s. for bed and breakfast and 20s. for Grade II hotels. The fees are payable to the secretary, W. T. Edwards, F.R.I.C., A.I.M., 100 Rymond Road, Birmingham, 8.

## Uses for Chlorophyll

CHLOROPHYLL, now used as an ingredient in the manufacture of deodorants and soaps, will soon be used in a wide range of industrial and therapeutic processes, believe chemical experts in New York.

It will be used in anti-knock compounds, vulcanisation of rubber, photochemical processes, paints, plastics and textiles. It will be used in the treatment of cancer, heart diseases, ulcers and many other illnesses. It might also prove to be the basis of the only non-toxic antibiotic drug known to doctors.

Mr. John Kephart, vice-president of the National Chlorophyll Co., one of the largest producers in the United States, has disclosed in New York some of the ways in which his company is developing its uses of chlorophyll.

It has already taken out patents for the use of chlorophyll in the vulcanisation of rubber, as a sensitising reagent in photochemical processes and as an anti-knock compound for use in petrol.

Textile mills, he says, have also been investigating the possibilities of using chlorophyll as a 'built-in' deodorant in their cloths. Paint manufacturers are examining its possibilities in making a fresh-smelling paint and plastics producers hope that chlorophyll will help to remove the residual smell of their products.—B.U.P.

## Grain Alcohol from Wood

GRAIN alcohol can now be made from wood-waste materials which cost less than half as much as blackstrap molasses—one of the principal raw materials now in use—according to a spokesman of the Tennessee Valley Authority of America recently. Wastes from lumbering and wood manufacturing operations have been processed in a pilot plant to produce a synthetic molasses which—on a commercial basis—would cost about 12.6 cents a gallon, as compared with blackstrap molasses at 34 cents a gallon.

The wood molasses can be used in animal feeds and in silage, as well as for alcohol production, and will provide an economically feasible outlet for large amounts of non-timber hardwoods and wastes in the Tennessee Valley area and elsewhere.

The process described is a form of hydrolysis of the wood with dilute sulphuric acid.

## Staveley Compensation

### Chemical & Technical Aspects

CHEMICAL aspects of the Staveley Iron and Chemical Company played a prominent part in the evidence given at several sessions of the hearing of the Iron and Steel Arbitration Tribunal which continued in London this week.

The company was nationalised when the steel industry was transferred to State ownership in February, 1951. The Ministry of Supply has offered £5,100,000, against £8,750,000 sought by the company.

In his evidence, Mr. Thomas A. McKenna, chairman and managing director of the company said, referring to the chemical position, that the bulk of the business was on contract, which enabled a reliable estimate to be made of the profits which could be expected.

Between July 1947 and June 1948, 16.7 per cent of deliveries had been under contract on spot terms; 32 per cent on two five-year contracts and 35 per cent on 12-month contracts. There was no difficulty in selling as much chemicals as could be produced.

The company's products had no more significance for military than civil uses declared Mr. McKenna, who denied a suggestion that the outbreak of the Korean war had had some bearing on the profits.

Giving evidence on the views of the Stock Exchange, Mr. Kemp-Welch, a member of the London Stock Exchange, stated that the chemical position was most promising, and the market he thought would have taken the view that the company would have every chance of taking advantage of the prospects.

### Technical Evidence Given

Technical evidence on the condition of the coke ovens at Staveley was given by Dr. G. E. Foxwell (Coppers Coke Oven and By-Product), president of the Institute of Fuel.

In January this year, he said, he inspected the plant knowing that the respondents had suggested that it should be rebuilt, and reached the conclusion that it was operating perfectly successfully. He further thought they were being run economically.

Dr. Foxwell gave figures to show the output of the by-products plant. These indicated that 3.61 per cent of tar was being produced, 26.6 lbs. of sulphate of ammonia per ton of coal carbonised, 4.8 gallons of benzole per ton of coal carbonised.

Tar figures were a little on the low side,

but this he thought was intentional. Sulphate of ammonia was above the average and the benzole was considerably better.

Continuing life of the 100 waste-heat ovens and of the 70 regenerative ovens was estimated by Dr. Foxwell at about 15 years.

In answer to Mr. B. J. M. MacKenna, Q.C., he said that the shatter test for coke had shown that in a new-type oven, such as would be installed if the Staveley ovens were scrapped, only 56 per cent of the coke produced would be of the requisite size. In order to increase this percentage it would be necessary to bring in coal from Wales or Durham to augment the supply of Derbyshire coal, and this would increase the cost per ton of coal carbonised by nine shillings or ten shillings. This would turn the present coke profit at Staveley into a loss.

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## Leeds Endowment Gift

AT a meeting of the Council of the University of Leeds on 16 July, the gift of a £2,000 endowment was recorded from the directors of Johnson Bros. (Dyers), Ltd., of Bootle. The company had signified its intention of providing an endowment fund of £2,000 to provide two studentships each of £50 a year in the colour chemistry and dyeing department.

The gift is intended to commemorate the services of Mr. Oswald Gunnell, who prior to his death was chairman and managing director of the company. It will also be a form of acknowledgement of the help received by the group from the University, as no less than ten of its chemists and managers have been students of the dyeing department. When Mr. Gunnell retired he had served the firm for 56 years, during which period he rose from the position of a young chemist, to works manager, general manager, until 15 years ago he became chairman and managing director.

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### Chloromycetin Anaemia

An unconfirmed report that some patients taking chloromycetin in the U.S.A. have suffered a serious type of anaemia as a result of taking the drug has caused the Food and Drug Administration of America to undertake an investigation, it is reported.

## Weed-Killing Trials

### Large-Scale Tests Launched in Canada

UNDERTAKEN to find out the best way of applying weed-killing chemicals, a large-scale spraying programme was launched over hundreds of miles of tracks by the Canadian National Railway a few weeks ago.

Last year smaller tests were made to prove the effectiveness of chemical control of weeds and brushwood along the line and these have now been followed by experiments in the use of appliances and in various chemical mixtures and formulae.

### Combinations Used

The principal weed-killers being employed are 2,4-D and 2,4,5-T, which is specially used for killing brushwood. Both are being used alone and in combination with each other. Also, in different concentrations of these chemicals are being tried out in order to find out the mixtures which are most suitable under given conditions and which are most economical to use.

The present experiments, which are among the largest of their kind so far undertaken in Canada, are being closely studied and watched, not only by the railways themselves, but by the chemical research organisations in Canada and U.S. and by other large-scale users and manufacturers.

The operations cover roughly three separate areas. By far the largest is the onslaught on weeds along 2,100 miles of track in the farming districts of Western Ontario and parts of Quebec. This is being carried out partly by train spraying equipment and partly by smaller sprayers. The train spraying was scheduled to cover about 1,100 miles of track at the rate of about 50 miles a day. The remainder would be done by the smaller equipment. This operation also has in view the prolonging of the life of the railway sleepers.

A 650-mile section of the line from the Peterboro-Lindsay division to Port Arthur and Armstrong is to be power-sprayed.

Total expenditure on these operations is estimated at \$255,000 (roughly £91,071). Work is to be costed and results compared with the cost of the older methods of control.

## Paint Link-up Plan

A COMBINATION, to form what is claimed to represent the largest paint producers in the British Empire, is announced by the taking into partnership of Pinchin Johnson & Associates, Ltd., by Petrochemicals, Ltd., and Lewis Berger & Sons, Ltd.

Four years ago Styrene Co-Polymers Ltd. was formed jointly by Petrochemicals Ltd., and Lewis Berger & Sons Ltd. to operate the styrene co-polymer patents owned by the Lewis Berger organisation and to manufacture styrene co-polymers and alkyd resins from a styrene distillate fraction produced by Petrochemicals Ltd. in their Catarole process for the cracking of petroleum.

A modern factory was constructed on the Petrochemicals site at Partington, Cheshire, equipped for large-scale and economic production of styrene co-polymers and alkyd resins. Bulk manufacture commenced in June 1951 and since then the products have been distributed throughout the world. Styrene Co-Polymers Ltd. have already entered into arrangements for the manufacture of their products both in Germany and Australia.

Pinchin Johnson & Associates, Ltd., owners of certain patents in the styrene co-polymer field, will bring those patents into the common pool with the Berger patents.

The policy of Styrene Co-Polymers Ltd. is to rationalise the manufacture of synthetic media and so to enter into large-scale production of a limited number of types with consequent economies in handling costs and storage costs and to provide synthetic media of constant quality at lower prices.

### Big Installation Order

Styrene Co-Polymers Ltd. has placed an order for the installation of a new 4,500 gallon reactor for the manufacture of styrenated alkyds, which incorporates unique new features. This reactor will be the largest ever installed for the manufacture of such products and will be completed within about a year.

It is considered that the synthetic resin plants already installed in some of the overseas factories owned by the Berger and Pinchin Johnson companies may provide facilities for the manufacture in those countries of the products of Styrene Co-Polymers Ltd. from this country.

## Kellogg Expand Plant

Kel-F Plastic Production to Rise

PLANS for the production in expanded commercial quantities of Kel-F, strategic polytrifluoromonoethylenes, with its extraordinary resistance to heat, moisture and chemical action, were announced recently in America by the president of the M. W. Kellogg Company (subsidiary of Pullman Incorporated). New production facilities representing an initial expenditure of about \$1,000,000, it was revealed, are now under construction at the Jersey City, N.J., development and manufacturing centre of Kellogg, leading designers and builders of petroleum and chemical processing plants. Scheduled to go into operation before the end of this year, the new plant will enable Kellogg to meet increasing demand for Kel-F for both military and industrial purposes.

Kel-F plastic had its origin in connection with the development of special materials for the Oak Ridge atomic energy plant. It has been produced on a commercial basis by Kellogg since 1947. Research in laboratory and pilot plant over a period of years has resulted in a continuous manufacturing process. The increased demand for the product, three previous price reductions, and the evolution of this new process have made the present production expansion practicable. On completion of the new plant, output of Kel-F will be increased to more than 1,000,000 lb. annually, together with manufacturing economies which are expected to provide a basis for further price reduction.

Simultaneously with this expansion of its manufacturing facilities, Kellogg intend to enlarge their technical consulting service and technical sales service to meet the requirements of Kel-F moulders and end-users, and to seek new uses for it. Present uses for it are as insulation in electronics, in wide-temperature range equipment in aviation, for packaging and food wrapping, and as a lubricant.

## New Factory Opens

A.P.V. Starts Production at Crawley

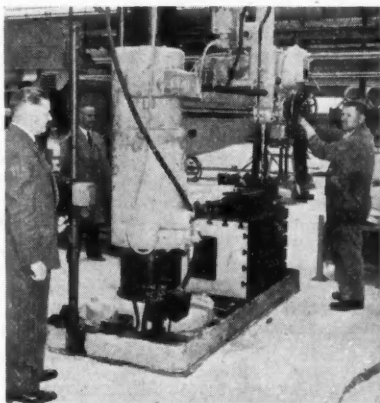
THE first stage in the transfer of its production facilities from four separate factories to new 17-acre premises at Manor Royal, Crawley New Town, was begun this month by the A.P.V. Company, Ltd.

Comprising press shops, foundries, machine shops, assembly shops and general stores, the new works will manufacture stainless steel equipment for the chemical, brewery, dairy, food, and defence industries and will employ some 700 people when the move is completed by July, next year.

The factory and foundry consist of 200,000 sq. ft. of covered floor space of which approximately 160,000 sq. ft. are covered by cranes. Over £70,000 has been spent on the heating installation for the factory and the amenities will be among the most modern in the country.

Design of the factory and foundry have been considerably influenced by studies abroad, both in Europe and America. Considerable stress has been laid by the planners on efficient materials handling, and in the factory this will be largely based on the pallet and fork lift truck system; in the foundry over £50,000 has been spent on a mechanised system of handling and treating casting sand.

Production at Crawley was begun on Monday, 14 July, when Mr. R. May, general works manager, who will be in charge of the plant, switched on the first machine. The first batch of machines had been transferred from the White City and installed during the week-end to avoid any break in production.



Mr. R. May, A.P.V. works manager, who joined the company as an apprentice 40 years ago, switches on the first machine to start production at the new factory at Manor Royal, Crawley New Town

## Sulphur Allocations

### Demand Still Exceeds Rising Output

SULPHUR allocations for the last six months of 1952 were announced by the International Materials Conference, Washington, on 21 July. The United Kingdom is to receive 195,000 tons with an import quota of 177,000 tons.

Allocations were unanimously accepted by the member Governments, of which the following 16 were represented on the sulphur committee:—Australia, Belgium (representing Benelux), Brazil, Canada, France, the Federal Republic of Germany, India, Italy, Mexico, New Zealand, Norway, Sweden, Switzerland, the Union of South Africa, the United Kingdom and the United States.

The committee agreed that half of the quantities should constitute the allocation for the third quarter, and the other half the allocation for the fourth quarter, with the proviso that the committee may review the allocation for the fourth quarter.

### Reduction in Stocks

In 1950 and the first half of 1951, before the first of the Sulphur Committee's plans of international distribution, consumption exceeded production by 7.8 and 8.3 per cent respectively. This led to a serious reduction in world stocks. Since July, 1951, however, as a result of the committee's allocations, consumption has virtually been brought into line with production and the severe drain on stocks halted. This, however, has meant a reduction in consumption below the level of demand.

Production in the last half of 1952 is estimated at an annual rate of 6,400,000 long tons, compared with 5,900,000 in 1950 and 6,140,000 in 1951. However, although production in the last half of 1952 is expected to increase to 3,200,000 long tons, it still falls short of requirements, which are estimated at 3,830,000 long tons.

It has been agreed that domestic users in the U.S.A. or in other countries may purchase any sulphur allocated to other countries participating in the International Materials Conference and not used by any such participating country.

As on previous occasions, the committee dealt only with crude sulphur and did not allocate the relatively small quantities of refined sulphur which enter into international trade.

The largest appropriation of crude sulphur, 2,307,300 tons, goes, of course, to the U.S.A. (including Canada), with the United Kingdom next. Some of the other major shares were: Italy (76,000); France (75,500); Japan (70,000); Australia (67,000); Federal Republic of Germany (41,000); Union of South Africa (36,000); Belgium-Luxembourg (32,000); and India (30,000).

## Texas Fertiliser Explosion

THE explosion of a cargo of ammonium nitrate belonging to the U.S. Government off Texas City in 1947, which killed roughly 560 people and injured 1,000, as well as wiping out Monsanto's Texas City styrene plant, has come up at the Fifth Circuit Court of Appeals recently. This court has reversed the decision of the District Court judge on 13 April, 1950, who put the blame squarely on the Federal Government for disregarding public safety in a 'shocking' manner, and has ruled that the District Court erred in calling ammonium nitrate explosive, and that the plaintiffs (300 of them) failed to prove that the Government employees were negligent. There was no evidence, ruled the judge, that there was failure to use ordinary and reasonable care. The Government was manufacturing not an inherently dangerous explosive such as dynamite, but fertiliser which was safe if dealt with normally. Ammonium nitrate only became explosive, he said, when combined with other explosive compounds such as TNT. When not combined with substances such as these, it constituted only a fire hazard, that is, it would burn but not explode.

To the 8,500 people who sued the Government for damages after the blast, of whom Monsanto Chemical Co. was about the biggest, with a \$50,000,000 claim, this conclusion may sound a little academic. There are, however, two further chances for them to win the case. Either the Circuit Court can rehear it, or, if that is turned down, a review by the U.S. Supreme Court can be obtained.

### New Zealand Salt

About 600 tons of salt were produced from this season's harvest at Lake Grassmere. This was New Zealand's first production of salt in commercial quantities.



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## The Chemist's Bookshelf

**MIXTURES: The Theory of the Equilibrium Properties of Some Simple Classes of Mixtures, Solutions and Alloys.** By E. A. Guggenheim. London, Oxford University Press. 1952. Pp. 270. 42s.

Readers of Professor Guggenheim's well-known book on thermodynamics will be familiar with the prominence given therein to the statistical nature of thermodynamics. In this new book the author applies the methods of statistical thermodynamics to certain models of solid, liquid and gaseous mixtures. The simple classical models are used for solid and gaseous mixtures but for liquid mixtures the quasi-crystalline model is chosen and the liquid is regarded as a disordered solid. While such models are applicable to only the simplest mixtures, their study leads to interesting problems and, where comparison between theory and experimental results is possible, agreement is generally good.

The first two chapters of the book provide synopses of the most important formulae of classical and statistical thermodynamics. These are then used in the examination of ideal, regular and dilute solutions leading to the prediction of thermodynamic functions and such properties as miscibility, osmotic pressure and activities. The treatment is then extended to lattice imperfections and superlattices in solid mixtures, to gaseous mixtures and the surfaces of simple liquid mixtures. The final third of the book is devoted to the treatment of mixtures involving molecules of differing sizes, including athermal and non-athermal mixtures and solutions of macromolecules.

Comparison of theoretical and experimental results is made throughout the book, one of the most interesting sections in this respect being the chapter on solutions of macromolecules in which the predictions of the Flory treatment are compared with the experimental results for high polymer solutions. As the author points out, there is a

need for more extensive and precise measurements on the simpler systems. The author's hope that the book will provide a stimulus to such work is likely to be fulfilled.

The style is a model of clarity and the approximations used are clearly and precisely stated so that the reader is in no doubt as to their nature. Though the book is essentially one for the graduate research worker, a reasonable knowledge of classical and statistical thermodynamics being assumed, it is well documented with references and is likely to be indispensable to those interested in theoretical studies of solutions and mixtures.—W.R.M.

**EINFÜHRUNG IN DIE CHEMIE UND TECHNOLOGIE DER KUNSTSTOFFE.** By F. Runge. Akademie-Verlag, Berlin. 1952. Pp. 156. \$2.88.

There are many books written on high polymer chemistry and technology. Many of these, however, are for the graduate or research chemist. This introduction to the chemistry and technology of synthetic materials is intended for chemistry students and for use in technical colleges. The term synthetic materials is used in a wide sense to include some natural polymer materials.

The first third of the book deals with the general preparation and properties of synthetic high polymers, including sections on additive and condensation polymerisation, the physical chemistry of high polymers, their physical and chemical properties and outlines of methods of manufacture of finished products. The remainder of the book deals with different high polymers in some detail, considering successively polymers of the ethylene and vinyl types, polyaddition compounds such as 'Bakelite', the polyamides, silicones and materials derived from natural products such as cellulose, proteins and rubber. This part of the book includes a brief but useful survey of the technical preparation of starting materials. A table at the end of the book summarises the different polymers and corresponding

monomers and includes their important uses and trade names used in different countries.

Inevitably, in a book of this type, treatment in such a wide field must be brief. In most cases essential material does not appear to have been sacrificed and basic principles are clearly outlined. In possibly a few cases treatment might have been more detailed. Thus light scattering of polymer solutions might have been mentioned. The section on viscosity measurements in the determination of molecular weights is perhaps a little out of date. It is the intrinsic rather than specific viscosity which is related to molecular weight and the Staudinger relationship is often only approximate. It should be made clear that molecular weights are average values and that different methods of determination give different kinds of average.

These are minor criticisms since, for readers of German, the book provides a very useful and generally up-to-date survey of the preparation and properties of synthetic high polymers, usefully summarised, in many cases, by tables.—W.R.M.

## Fertiliser Output

### Census of Production for 1948

**A**N increase in the number of larger establishments engaged in the fertiliser and allied trades and an improvement in gross output are revealed in the Final Report on the Census of Production for 1948, Volume 2, Trade C, published by the Board of Trade (HMSO, 3s. net).

The report on fertiliser, disinfectant, insecticide, and allied trades relates to establishments wholly or mainly engaged in the manufacture of artificial manures, fertilisers, disinfectants, insecticides, sheep and cattle dips and weedkillers, including two Government establishments, in 1948. (A summary of the preliminary report, No. 129, appeared in *THE CHEMICAL AGE*, 64, 316).

These trades correspond to minimum list heading 31 (2) in the Standard Industrial Classification.

Figures for production, costs of materials, stocks, numbers of persons employed, wages and salaries, and so on, for 1948 are shown in comparison with the years 1937 and 1935.

Any establishments in Northern Ireland are excluded in 1948. Owing to the risk of dis-

closure of information relating to individual firms, separate particulars of the output in Northern Ireland were not published for 1935.

In 1948 the total number of larger establishments (i.e. those employing 10 or more persons) numbered 172, employing 15,254 persons. Of these firms 135 were situated in England, six in Wales, and 31 in Scotland. The number of larger establishments in the United Kingdom in 1935 was 123.

### Growth Reflected

Growth of the fertiliser and allied trades is reflected in the gross output (production) which was valued (in £'000) at £30,945 in 1948 for Great Britain only, compared with £6,132 in 1937 and £5,362 in 1935 for the United Kingdom.

The average number of persons employed by smaller firms (i.e., employing 10 persons or less), was 948.

Total make of sulphuric acid recorded on schedules for the fertiliser, disinfectant, insecticide and allied trades in 1948 was 169,900 tons, compared with 149,900 tons in 1937, and 121,500 tons in 1935.

Costs of materials and fuel purchased amounted to £21,445,000 for Great Britain only in 1948 as against £3,807,000 in 1937 and £3,225,000 in 1935 for the United Kingdom.

Plant and machinery acquired by the larger establishments in 1948 amounted to £549,000 worth of new and £24,000 worth of second-hand, while disposals were valued at £15,000.

Of the 172 larger establishments, 114 were specialist producers of fertilisers, 49 of disinfectants, antiseptics, insecticides, weedkillers, sheep and cattle dips and like products, with nine in the remainder of the trades.

Repair and maintenance by the larger establishments in 1948 amounted to £371,000, comprised of £73,000 for buildings, £194,000 for plant, machinery, and vehicles, and the remainder unclassified. A sum of £10,000 was expended on research work, divided among research associations (£3,000), universities, institutions, academic bodies and similar agencies (£3,000), and other commercial concerns (£4,000).

Total numbers employed by private firms in Great Britain in 1948 were 14,040, plus 26 working proprietors.



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## PERSONAL

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The resignation of PROFESSOR SIR ALFRED EGERTON, F.R.S., from his post as a vice-president, is announced by the British Iron and Steel Research Association. Mr. H. H. BURTON, C.B.E. (English Steel Corporation, Ltd.) has been elected in his place. The honorary officers of the association are: *President*, SIR ANDREW MCCANCE, F.R.S.; *vice-presidents*: H. H. BURTON, C.B.E.; DR. C. H. DESCH, F.R.S.; SIR WILLIAM J. LARKE, K.B.E.; and J. MITCHELL, C.B.E.

The following officers and Executive Committee will serve the Industrial Pest Control Association for the year 1952-53:—*President*, Mr. S. W. HEDGCOCK, Chelsea Insecticides, Ltd.; *vice-president*, Mr. DUNCAN R. LEITCH, Ratsouris, Ltd.; *honorary treasurer*, Mr. S. F. SPRANGE, The London Fumigation Co., Ltd.; *honorary auditors*: Mr. C. L. CLAREMONT, Rodent & Insect Pest Destruction Co., and Mr. G. P. POLLARD, Petrochemicals, Ltd.; *executive committee*: Mr. K. F. GOODWIN-BAILEY, Cooper McDougall & Robertson, Ltd.; Mr. D. J. S. HARTT, May & Baker, Ltd.; DR. N. E. HICKIN, Rentokil, Ltd.; Mr. J. L. HUNT, Shell Chemicals, Ltd., and Mr. C. STUART KREGOR, W. Edmonds & Co., Ltd. The secretary is Mr. W. A. WILLIAMS, M.B.E., B.Sc., 166 Piccadilly, W.1.

Mr. F. GRAUCOB, managing director of Nu-Swift, Ltd., has been elected chairman instead of Mr. A. HARLAND, who has resigned owing to advancing years. Mr. Harland has accepted the honorary post as president of the company. Mr. E. E. C. CAWOOD, M.B.E., general manager, has been appointed technical director.

Mr. C. STOTT, M.C., B.Sc., M.I.Chem.E., M.Inst.Gas E., who was at one time chief assistant chemist to the Farnley Iron Company and later chemical engineer and assistant manager to the Magnesite Syndicate Ltd., Suramanhaham, S. India, and is now deputy chief engineer of the South Eastern Gas Board, has been appointed to take charge of a central construction department which the Board has decided to set up to be responsible for the planning and progress of major constructional work throughout the area. He joined the South Metro-

politan Gas Company in 1926 and after occupying various positions became assistant chief engineer. When the gas industry was nationalised Mr. Stott was appointed deputy chief engineer to the South Eastern Gas Board and engineer of the Metropolitan Division.

The following officers will serve the Association of British Insecticide Manufacturers during 1952: *chairman*: DR. E. HOLMES, Plant Protection Ltd.; *vice-chairman*: Mr. N. K. SMITH, The Murphy Chemical Co., Ltd.; *hon. treasurer*: Mr. R. V. CRAVEN, W. J. Craven & Co., Ltd., and *hon. auditor*: Mr. A. G. PONTON, Pan Britannica Industries Ltd. The executive committee will consist of Messrs. J. M. BUTLER, Shell Chemicals Ltd.; R. V. CRAVEN, W. J. Craven & Co., Ltd.; M. N. GLADSTONE, Pest Control Ltd.; D. J. S. HARTT, May & Baker Ltd.; H. J. JONES, Hemingway & Co., Ltd.; F. W. SUGDEN, Plant Protection Ltd.

Mr. J. D. BLAKELEY, M.Sc., F.R.I.C., well known as a specialist on asbestos, silicates and heat insulation, is now associated with Dr. M. A. Phillips and Associates, the Romford, Essex, consulting chemists and chemical engineers.

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### A Rival to Cortisone

A NEW pharmaceutical manufactured by Geigy Co., Inc. of America, is 3,5-dioxo-1,2-diphenyl-4-*n*-butyl pyrazolidine, better known as phenyl butazone chemically, and 'Butazolidin' by its trade name. This drug is said to be almost as effective as cortisone in treating rheumatoid arthritis, and also to cover a wider range of diseases. Representative of these are gout, rheumatic fever, bursitis, lumbago, neuralgia, sciatica and certain spinal disorders. Side effects—one of the major drawbacks of cortisone—are said to be fewer, the drug having little or no effect on the kidneys or blood pressure. Allergic reactions have been experienced, but these die down after the treatment is stopped. Like cortisone, however, the new compound is said to be a palliative, not a cure, and the condition returns on cessation of treatment. It is much cheaper.

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## HOME

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### Film Library Moved

The Central, Publicity Department of Imperial Chemical Industries, Ltd., has announced that its film unit and film library has moved to the North Block (ground floor) of Thames House, Millbank, London, S.W.1. The telephone number is Victoria 4486, but written communications should be addressed to Imperial Chemical House, Millbank, S.W.1.

### Imports of Agar-Agar

The Ministry of Food, in agreement with the Board of Trade announces that consideration will be given to applications to import a limited quantity of Agar-agar from Japan or South Korea (either direct or via Hong Kong) up to the end of September, 1952. Applications for import licences should be made on form ILB/A (Revised) obtainable from the Board of Trade, Import Licensing Branch.

### Potash Project in Yorkshire

Progress in the development of the potash deposits in Yorkshire was the subject of a question by Mr. J. Baker White in the House of Commons on 14 July. In a written answer, Brig. H. R. Mackeson stated that a great deal of exploration and proving work had been undertaken, but the economic exploitation of these deposits set many problems. All the relevant knowledge and experience was being collected and examined.

### Chemicals and Overseas Trade

Exports of chemicals, drugs, dyes and colours decreased from £40,500,000 in the first quarter of 1952 to £35,300,000 in the second, but the total for the first half of the year (valued at £75,842,717), was still six per cent more than the average for 1951. Figures for the month ended 30 June at £10,465,583 were nearly £3,000,000 less than the previous month and more than £1,000,000 less than June, 1951. Some of this decline must no doubt be attributed to the world recession in textiles (reflected in the drop in exports of dyes, dyestuffs, etc.), and to the restrictions upon imports imposed by countries in the Commonwealth and elsewhere.

### Oil Pollution of the Sea

An intensified campaign to combat the pollution of sea water by oil has been planned by three British tanker companies. Oil and shipping experts and scientists will board an observation vessel for a two months study to determine the rate of flow, take samples, and generally find out what happens to oil when it is discharged into the sea. The behaviour and capacity of oil to persist under various weather conditions will also be examined.

### Copper and Brass Prices Raised

An Order increasing the price of secondary copper, brass, copper scrap, gilding metal scrap, brass scrap and cupro-nickel scrap was made by the Minister of Supply on 16 July. The rise was necessitated to take into account the recent increase in the Ministry of Materials selling price of virgin copper. New prices (with old in brackets) are: secondary copper, £285 10s-£245 (£279 10s-£239); brass, £253-£228 (£250-£225); copper scrap, £255-£213 (£250-£209); cupro-nickel scrap, £282-£242 (£279-£239); gilding metal scrap, £240 (£236); brass scrap, £215-£172 (£212-£169).

### Australian Visitor

Mr. John C. Thomas, head of the Thomas Optical & Scientific Company, of Melbourne, Australia, has visited the Stone (Staffs) factory of Quickfit & Quartz, Ltd., manufacturers of scientific and industrial chemical glassware. Accompanied by Mr. B. H. Turpin, technical and sales director, Mr. Thomas has also inspected the plant of the Cocker Chemical Company at Oswaldtwistle, and the I.C.I. Hillhouse plant at Thornton Cleveleys, near Fleetwood.

### Salt Imports

In reply to questions in the House of Commons recently the President of the Board of Trade, Mr. Thorneycroft, said that imports of salt to the value of £49,049 and £15,824 were brought into this country from Germany and Spain during the first five months of 1952. Over 98 per cent of these imports were fishery salt and he understood that the main demand for this came from the herring industry.

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## OVERSEAS

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### Sulphuric Acid Works

Sulphide Corporation, Pty., will spend about £1,250,000 on a new contact sulphuric acid plant at its Cockle Creek works, near Newcastle, New South Wales. The new plant will have a capacity of about 35,000 tons of acid yearly. The existing superphosphate plant will be greatly enlarged.

### New Silicone Product

A new product of the silicone family has been introduced to the American market. Known as SC-50, it is a liquid which is polymerised by contact with the atmosphere and forms a water-repellent surface. The main feature of SC-50 is that being liquid before polymerisation, it is the first available silicone preparation that is soluble in water. Experiments have shown its value in keeping masonry free from damp. It is hoped to extend its use to the manufacture of water-repellents for paper and textile products.

### Canadian Nickel Find

The recent find of nickel-copper deep under the Fecunis Lake at Sudbury Camp has now been declared a 'major discovery' by Mr. H. J. Fraser, vice-president of Falconbridge Nickel Mines. There might be a block of ore totalling 10,000,000 tons of nickel and copper in the drilled area, declared Mr. Fraser, who also said he thought that eventually Sudbury's 'north rim', might challenge the productive wealth of the company's main mine along the south rim of the basin, 45 miles away.

### Surpluses Anticipated

Output targets of 410,000,000 gallons of industrial alcohol and 5,200,000 tons of soda ash a year by 1955 have been set by the U.S. Defence Production Administration. It is warned, however, that some considerable over-production is probable as the expansion of alcohol capacity had to be authorised in order to increase output of some scarce chemicals. The position is aggravated also by the shut-down of the Government's synthetic rubber plants which formerly took 40 per cent of all U.S. industrial alcohol production.—B.U.P.

### Iraq Petroleum Output Record

A record increase in production by the Iraq Petroleum Company during the first six months of this year is shown by the rise from 670,744 tons in January to 1,447,646 tons in June. Total IPC production for the first half of this year showed an increase of 2,005,825 tons over the latter half of 1951.

### Warning Heeded

In a statement issued by the New South Wales Sheepbreeders' Association, the president says that a warning that half the wool now consumed in the world would be replaced by synthetic fibres in the next 10 to 20 years was a grim reminder to Australia. The prediction had been made by Dr. Roger Adams, of the University of Chicago's chemistry department, and though it had been ridiculed in some quarters, on-the-spot observers, like the California Woolgrowers' Association, shared fears held by many Australians about the possible effect of synthetic fibres upon the world's production of fine wool.

### Russian Analytical Progress

Recent advances in analytical chemistry by Russian chemists includes a new specific test for aluminium based on the bright pink colour (with yellow-green fluorescence) obtained by the interaction of the aluminium ion and, 1,4-dihydroxy-5,8-dichloroanthraquinone. Czech chemists have discovered a new reagent for ferrous iron—isonitrosodibenzoylmethane in ethyl alcohol—which gives a blue, benzene-soluble complex with ferrous ions in a solution buffered with sodium acetate. Another Russian discovery is the use of fuchsine-sulphite reagent for the determination of acetaldehyde in the presence of ethylene oxide. Accuracy claimed is said to be  $\pm 1$  per cent.

### More Insecticides for Middle East

Widespread insect infestation has led to an increasing demand for pesticides in the first six months of this year according to the U.S. Department of Commerce. Of the total of 17,374,905 lb. of conditioned sulphur licensed for export, among the leading importers were Egypt and Syria.—B.U.P.

## Publications & Announcements

THE new catalogue produced by AB Bofors Nobelkrut, Bofors, Sweden, is one of the most convenient and attractive seen for some time. It is in the form of a loose-leaf notebook with the pages of heavy art paper and with thumb-index. It gives a brief history of the development of the company since its formation by Dr. Alfred Nobel and contains a large number of colour and black and white photographs of the buildings and plant. It gives full analytical data, properties, uses and details of packing for each of the more than 40 chemical products they are producing. Copies of the catalogue can be obtained from the sole selling agents for AB Bofors, Guest Industrials, Ltd., 81 Gracechurch Street, London, E.C.3.

AN almost streamline flow through its body ensures that wear is reduced to negligible proportions in the glandless control valve produced by Capri Patents, Wellington, Shropshire. The valve, which has no moving metal parts in contact with the fluid passing through it, can be provided to handle organic solvents and is available in a range of sizes for all normal purposes. The method of construction ensures a long and foolproof life, even when pumping abrasives.



RECENTLY received is a copy of Polish Technical Abstracts for 1951. This contains extracts from sundry papers, printed in Polish, English and Russian. These include one on the separation of isomeric picolines and 2,6-lutidine by successive precipitation of the hydrochlorides, another on molasses as a source of chemical products, and a third on the synthesis of phosphorus thiochloride in almost theoretical yield by the heating of a mixture of phosphorus thiochloride and sulphur, with sulphur chloride as a catalyst, in a closed vessel at a temperature of 130°C. Source of the publication was the Główny Instytut, Dokumentacji Naukowo-Technicznej, Warsaw.

STANDARD methods for testing petroleum and its products are given in the 12th edition of the Petroleum Institute's manual on the subject just published. This gives the usual list of alphabetical and numerical methods of testing, with a list of obsolete method numbers and new and revised methods and specifications. Five appendices are given, together with the report of the standardisation committee and its constitution.

'BACKGROUND' is the title of a new technical newsletter, the first issue (July), of which has been published by the Central Publicity Department of Imperial Chemical Industries, Ltd. Articles describe the I.C.I. creep test research station at Witton; protection of materials against moths by application of Lanoc CN during dyeing; fabrication, application and technical facts about polytetrafluoroethylene (PTFE); and the manufacture of sulphuric acid from anhydrite. It is intended to produce the newsletter monthly. Dr. J. Gordon Cook is the technical editor.

MORE than 300 analysts in 26 countries have helped to build up knowledge of the iodine content of foods. Their findings, the yield of a century and a quarter, form the substance of 'Iodine Content of Foods' (Bibliography 1825-1951), the second volume in a series of critical studies of iodine literature being undertaken by the Chilean Iodine Educational Bureau, London. The book follows the same general lines as its predecessor 'Iodine and Plant Life,' and consists basically of an annotated list of 326 scientific papers known to contain qualitative or quantitative chemical facts about the presence of iodine in the foods of man and domestic animals. All these sources have been individually examined in the original, and data for 1207 different food items extracted from them. The material is arranged in 19 tables according to food type, the classification being practical rather than scientific. An introductory review gives a broad picture of the existing state of knowledge of the iodine content of foods and assesses the value of the practical value of the collected data.

# British Chemical Prices

LONDON.—The industrial chemicals market has displayed no special feature on the week and quiet conditions have prevailed in most sections of the market. Interest, however, would appear to be widening whilst there is a steady flow of inquiry both for home account and for shipment.

The price position remains steady and changes, where they have occurred, have generally been to slightly lower levels. As reported last week the basis prices for dry white lead, litharge and red lead have been reduced following the fall in the controlled price of pig lead.

Conditions in the coal tar products market are uncertain and with the possible exception of pitch and the creosote oils, inquiries for new business have been slow.

MANCHESTER.—In spite of holiday condi-

tions and the continued slackness in the textile trades a fair amount of new business has been reported on the Manchester market for heavy chemicals during the past week, with shippers still prominent with inquiries. Contract deliveries of caustic soda and other alkali products to home users have been on reasonably steady lines and this has also been the experience with regard to the potash, ammonia and magnesia compounds, as well as a wide range of other chemicals.

GLASGOW.—A fair demand generally at the beginning of the week was experienced in the Scottish general chemical market and business was slightly brisker. The latter part has been quieter, with the commencement this week-end of the Glasgow Fair Holiday. There is very little change to report in regard to the export market.

## General Chemicals

**Acetic Acid.**—Per ton: 80% technical, 1 ton, £110; 80% pure, 1 ton, £116; commercial glacial 1 ton, £130; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

**Acetic Anhydride.**—Ton lots d/d, £166 per ton.

**Acetone.**—Small lots: 5 gal. drums, £145 per ton; 10 gal. drums, £135 per ton. In 40/50 gal. drums less than 1 ton, £115 per ton; 1 to 9 tons, £114 per ton; 10 to 49 tons, to £113 per ton; 50 tons and over, £112 per ton.

**Alcohol, Industrial Absolute.**—50,000 gal. lots, d/d, 4s. 7½d. per proof gallon; 5000 gal. lots, d/d, 4s. 8½d. per proof gal.

**Alcohol, Diacetone.**—Small lots: 5 gal. drums, £204 per ton; 10 gal. drums, £194 per ton. In 40/45 gal. drums: less than 1 ton, £174 per ton; 1 to 9 tons, £173 per ton; 10 to 50 tons, £172 per ton; 50 to 100 tons, £171 per ton; 100 tons and over, £170 per ton.

**Allyl Alcohol.**—Less than 40 gals., 3s. 10½d. per lb.; 40 gal., 3s. 6½d. per lb.; 2 to 5 40 gal. drums, 3s. 4½d. per lb.; 1 ton and over, 3s. 2½d. per lb.

**Alum.**—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

**Aluminium Sulphate.**—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

**Ammonia, Anhydrous.**—1s. 9d. to 2s. 3d. per lb.

**Ammonium Bicarbonate.**—2 cwt. non-returnable drums; 1 ton lots £47 per ton.

**Ammonium Chloride.**—Grey galvanising, £31 5s. per ton, in casks, ex wharf. Fine white 98%, £23 12s. 6d. to £26 5s. per ton. See also Salammoniac.

**Ammonium Nitrate.**—D/d, £18 to £20 per ton.

**Ammonium Persulphate.**—MANCHESTER: £6 2s. 6d. per cwt. d/d.

**Ammonium Phosphate.**—Mono- and di-, ton lots, d/d, £93 and £91 10s. per ton.

**Antimony Sulphide.**—Golden, d/d in 5 cwt. lots as to grade, etc., 2s. 3½d. to 3s. 1½d. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

**Arsenic.**—Per ton, £59 5s. nominal, ex store.

**Barium Carbonate.**—Precip., d/d; 2-ton lots, £35 5s. per ton, bag packing.

**Barium Chloride.**—£44 10s. 2 ton lots d/d bags.

**Barium Sulphate (Dry Blanc Fixe).**—Precip., 4-ton lots, £41 per ton d/d; 2-ton lots, £41 5s. per ton d/d.

**Bleaching Powder.**—£21 per ton in casks (1 ton lots).

**Borax.**—Per ton for ton lots, in free 140-lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags; commercial, granular, £39 10s.; crystal, £42; powder, £43; extra fine powder, £44; B.P., granular, £48 10s.; crystal, £51; powder, £52; extra fine powder £53.

**Boric Acid.**—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £68; crystal, £76; powder, £73 10s.; extra fine powder, £75 10s.; B.P., granular, £81; crystal, £88; powder, £85 10s.; extra fine powder, £87 10s.

**Butyl Acetate BSS.**—£209 per ton, in 10-ton lots.

**Butyl Alcohol BSS.**—£181 per ton, in 10-ton lots. 10 to 49 tons £163 per ton.

*sec.* - **Butyl Alcohol.**—5 gal. drums £164; 40/45 gal drums: less than 1 ton £144 per ton; 1 to 10 tons £143 per ton; 100 tons and over £140 per ton.

*tert.* - **Butyl Alcohol.**—5 gal. drums £195 10s. per ton; 40/45 gal. drums: less than 1 ton £175 10s. per ton; 1 to 5 tons £174 10s. per ton; 5 to 10 tons, £173 10s.; 10 tons and over £172 10s.

**Calcium Chloride.**—70/72% solid £9 12s. 6d. per ton, in 4-ton lots.

**Chlorine, Liquid.**—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

**Chromic Acid.**—2s. 0½d. to 2s. 0½d. per lb., less 2½% d/d U.K.

**Citric Acid.**—1 cwt. lots, 218s. cwt. 5 cwt. lots, 213s. cwt.

**Cobalt Oxide.**—Black, delivered, 13s. per lb.

**Copper Carbonate.**—MANCHESTER: 2s. 10d. per lb.

**Copper Sulphate.**—£107 17s. 6d. per ton f.o.b., less 2% in 2-cwt. bags.

**Cream of Tartar.**—100%, per cwt., about £11 12s. d/d.

**Ethyl Acetate.**—10 tons and upwards, d/d £174 per ton.

**Formaldehyde.**—£35 per ton in casks, according to quantity, d/d.

**Formic Acid.**—85%, £82 5s. in 4-ton lots, carriage paid.

**Glycerine.**—Chemically pure, double distilled 1,260 s.g. £14 19s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

**Hydrochloric Acid.**—Spot, 12s. to 16s. per carboy d/d, according to purity, strength and locality.

**Hydrofluoric Acid.**—59/60%, about 1s. to 1s. 2d. per lb.

**Hydrogen Peroxide.**—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

**Iodine.**—Resublimed B.P., 21s. 3d. per lb. in cwt. lots.

**Iodoform.**—25s. 4d. per lb. in cwt. lots.

**Lactic Acid.**—Pale tech., 44 per cent by weight £122 per ton; dark tech., 44 per cent by weight £87 per ton ex works; Usual container terms.

**Lead Acetate.**—White: £162 10s. per ton.

**Lead Nitrate.**—£119 per ton.

**Lead, Red.**—Basis prices per ton: Genuine dry red lead, £154; orange lead, £166 Ground in oil: red, £178 10s., orange, £190 10s.

**Lead, White.**—Basis prices: Dry English, in 5-cwt. casks, £165 per ton. Ground in oil: English, under 2 tons, £184 10s.

**Lime Acetate.**—Brown, ton lots, d/d, £30 to £34 per ton; grey, 80-82%, ton lots, d/d, £34 to £39 per ton.

**Litharge.**—£154 per ton.

**Magnesite.**—Calcined, in bags, ex works, £22 to £24.

**Magnesium Carbonate.**—Light, commercial, d/d, £87 15s.; cwt. lots £97 10s. per ton d/d.

**Magnesium Chloride.**—Solid (ex wharf), £15 per ton.

**Magnesium Oxide.**—Light, commercial, d/d, £221; cwt. lots £227 10s. per ton d/d.

**Magnesium Sulphate.**—£12 to £14 per ton.

**Mercuric Chloride.**—19s. 3d. per lb. in 28 lb. lots; smaller quantities dearer.

**Mercury Sulphide, Red.**—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

**Methanol.**—Pure synthetic, d/d, £28 to £38 per ton.

**Methylated Spirit.**—Industrial 66° O.P. 100 gals., 7s. 10d. per gal.; pyridinised 64° O.P. 100 gal., 7s. 11½d. per gal.



**Methyl Ethyl Ketone.**—5 gal. drums, £179 per ton; in 40-45 gal. drums, less than 1 ton, £159 per ton; 50 to 100 tons, £156 per ton; 100 tons and over, £155 per ton.

**Methyl isoButyl Ketone.**—5 gal. drums, £209 per ton; in 40-45 gal. drums, less than 1 ton, £189 per ton; 50 to 100 tons, £186 per ton; 100 tons and over, £185 per ton.

**Nickel Sulphate.**—D/d. buyers U.K. £140 10s. per ton.

**Nitric Acid.**—£35 to £40 per ton, ex works.

**Oxalic Acid.**—About £181 per ton, packed in 5-cwt. lots, packed in free 5-cwt. casks.

**Phosphoric Acid.**—Technical (S.G. 1.500), ton lots, carriage paid, £71 10s. per ton; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

**Potash, Caustic.**—Solid, £98 10s. per ton for 1-ton lots; Liquid, £37 15s.

**Potassium Bichromate.**—Crystals and granular, 11½d. per lb.; ground, 1s. 0½d. per lb., standard quantities.

**Potassium Carbonate.**—Calcined, 98/100%, £116 per ton for 1-ton lots, ex store.

**Potassium Chloride.**—Industrial, 96%, 6-ton lots, £20 to £22 per ton.

**Potassium Iodide.**—B.P., 18s. 7d. per lb. in 28 lb. lots.

**Potassium Nitrate.**—Small granular crystals, 81s. per cwt. ex store, according to quantity.

**Potassium Permanganate.**—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6½d. per lb.; technical, £8 3s. per cwt.; for 5 cwt. lots.

**isoPropyl Alcohol.**—Small lots: 5 gal. drums, £156 per ton; 10 gal. drums, £146 per ton; in 40-45 gal. drums: less than 1 ton, £126 per ton; 1 to 9 tons, £125 per ton; 10 to 50 tons, £124 per ton; 50 to 100 tons, £123 per ton; 100 tons and over, £122 per ton.

**Salmoniac.**—Dog-tooth crystals, £72 10s. per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

**Salicylic Acid.**—MANCHESTER: Technical 2s. 6d. to 2s. 7d. per lb. d/d.

**Soda Ash.**—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

**Soda, Caustic.**—Solid 76/77%; spot, £23 5s. per ton d/d. (4 ton lots).

**Sodium Acetate.**—£85 to £91 per ton d/d.

**Sodium Bicarbonate.**—Refined, spot, £12 7s. 6d. per ton, in bags.

**Sodium Bichromate.**—Crystals, cake and powder, 9½d. per lb.; anhydrous, 11½d. per lb., new d/d U.K. in 7-8 cwt. casks.

**Sodium Bisulphite.**—Powder, 60/62%, £40 per ton d/d in 2-ton lots for home trade.

**Sodium Carbonate Monohydrate.**—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

**Sodium Chlorate.**—£87 to £95 per ton.

**Sodium Cyanide.**—100% basis, 8d. to 9d. per lb.

**Sodium Fluoride.**—D/d, £4 10s. per cwt.

**Sodium Hyposulphite.**—Pea crystals £28 a ton; commercial, 1-ton lots, £26 per ton carriage paid.

**Sodium Iodide.**—B.P., 20s. 1d. per lb. in 28 lb. lots.

**Sodium Metaphosphate (Calgon).**—Flaked, loose in metal drums, £123 ton.

**Sodium Metasilicate.**—£22 15s. per ton, d/d U.K. in ton lots.

**Sodium Nitrate.**—Chilean Industrial, 97-98%, 6-ton lots, d/d station, £30 15s. per ton.

**Sodium Nitrite.**—£31 for 1 ton lots.

**Sodium Percarbonate.**—12½% available oxygen, £8 8s. 4½d. per cwt. in 1-cwt. drums.

**Sodium Phosphate.**—Per ton d/d for ton lots: Di-sodium, crystalline, £37 10s., anhydrous, £78 10s.; tri-sodium, crystalline, £39 10s., anhydrous, £75 10s.

**Sodium Prussiate.**—10d. to 10½d. per lb. ex store.

**Sodium Silicate.**—£6 to £11 per ton.

**Sodium Sulphate (Glauber's Salt).**—£8 per ton d/d.

**Sodium Sulphate (Salt Cake).**—Unground, £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

**Sodium Sulphide.**—Solid, 60/62%, spot, £30 per ton, d/d, in drums; broken, £30 15s. per ton, d/d, in drums.

**Sodium Sulphite.**—Anhydrous, £59 per ton; pea crystals, £37 12s. 6d. per ton d/d station in kegs; commercial, £23 7s. 6d. per ton d/d station in bags.

**Sulphur.**—Per ton for 4 tons or more, ground, £22 16s. 6d. to £25 6s. according to fineness.



**Tartaric Acid.**—Per cwt. : 10 cwt. or more, £13.

**Titanium Oxide.**—Comm., ton lots, d/d (56-lb./112 lb. bags), £125 per ton.

**Zinc Oxide.**—Maximum price per ton for 2-ton lots, d/d ; white seal, £153 10s. ; green seal, £152 10s. ; red seal, £151.

#### Rubber Chemicals

**Antimony Sulphide.**—Golden, 2s. 3½d. to 3s. 1½d. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

**Carbon Bisulphide.**—£65 5s. per ton, according to quality.

**Carbon Black.**—6d. to 8d. per lb., according to packing.

**Carbon Tetrachloride.**—£74 10s. per ton.

**India-rubber Substitutes.**—White, 1s. 9d. to 2s. 2d. per lb. ; dark, 1s. 7½d. to 2s. 0½d. per lb.

**Lithopone.**—30%, £65 per ton.

**Mineral Black.**—£7 10s. to £10 per ton.

**Mineral Rubber, 'Rupron.'**—£20 per ton.

**Sulphur Chloride.**—British 48s. 6d. per cwt.; Imported £120 per ton.

**Vegetable Lamp Black.**—£49 per ton

**Vermilion.**—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

#### Nitrogen Fertilisers

**Ammonium Sulphate.**—Per ton in 6-ton lots, d/d farmer's nearest station, £16 18s.

**Compound Fertilisers.**—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1 £27 9s.

**'Nitro-Chalk.'**—£12 9s. 6d. per ton in 6-ton lots d/d farmer's nearest station.

**Sodium Nitrate.**—Chilean agricultural for 6-ton lots d/d nearest station, £30 15s. per ton.

#### Coal-Tar Products

**Benzole.**—Per gal, ex works : 90's, 3s. 8½d. ; pure, 3s. 11½d. ; nitration grade, 4s. 2½d.

**Carbolic Acid.**—Crystals, 1s. 6d. to 1s. 8d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 6d. to 1s. 8d. per lb., d/d crude, 8s. naked, at works.

**Creosote.**—Home trade, 10d. to 1s. 2d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 6d. per gal.

**Cresylic Acid.**—Pale 99%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 5s. to 5s. 8d. naked at works.

**Naphtha.**—Solvent, 90/160°, 4s. 2½d. per gal. for 1000-gal. lots ; heavy, 90/190°, 3s. 8d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots.

**Naphthalene.**—Crude, ton lots, in sellers' bags, £18 16s. 3d. to £34 per ton according to m.p. ; not-pressed, £50 to £60 per ton, in bulk ex works ; purified crystals, £68 10s. to £79 3s. 4d. per ton.

**Pitch.**—Medium, soft, home trade, 130s. per ton f.o.r. suppliers' works ; export trade, 200s. per ton f.o.b. suppliers' port. MANCHESTER : £7 10s. f.o.r.

**Pyridine.**—90/160°, 42s. 6d. per gal. MANCHESTER : 40s. to 42s. 6d. per gal.

**Toluol.**—Pure, 4s. 7½d. per gal. MANCHESTER : Pure, 4s. 7½d. per gal. naked.

**Xylol.**—For 1000-gal. lots, 5s. 1½d. per gal., according to grade, d/d.

#### Intermediate and Dyes (Prices Nominal)

*m*-Cresol 98/100%.—3s. 9d. per lb. d/d.

*o*-Creso 30/31° C.—1s. 4d. per lb. d/d.

*p*-Cresol 34/35° C.—3s. 9d. per lb. d/d.

**Dichloraniline.**—2s. 8½d. per lb.

**Dinitrobenzene.**—8½d. per lb.

**Dinitrotoluene.**—48/50° C., 9½d. per lb. ; 66/68° C., 1s.

*p*-Nitraniline.—2s. 11d. per lb.

**Nitrobenzene.**—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

**Nitronaphthalene.**—1s. 2d. per lb. ; P.G. 1s. 0½d. per lb.

*o*-Toluidine.—1s. per lb., in 8/10-cwt. drums, drums extra.

*p*-Toluidine.—2s. 2d. per lb., in casks.

*m*-Xylidine Acetate.—4s. 5d. per lb., 100%

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The well-known cylindrical 7-ampoule rigid carton has disappeared. B.D.H. Concentrated Volumetric Solutions are now issued in a new package of six ampoules. This gives even more security than the original container, costs less, and is more compact. While the ampoules are unchanged, increasing production and the more economical packing enable them to be supplied at much lower prices. The new range includes a carton of solutions for the precise determination of water hardness by the Schwarzenbach method. Please ask for a copy of the price list. *The accuracy of solutions prepared as directed from B.D.H. Concentrated Volumetric Solutions is within the factor limits of 0.999 and 1.001.*

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CVS 3

## Chemical & Allied Stocks & Shares

THE rally in stock markets which developed earlier in the month has been followed by a reaction, particularly in British Funds and industrial shares, now that Mr. Churchill has warned of fresh measures to be taken to deal with current problems, and the vital need to increase exports if gold and dollar reserves are to be rebuilt. Next week's debate in Parliament will reveal the new measures, which, it is generally assumed, will entail cuts for the home market and also probably some modification of the rearmament programme, so that larger supplies of materials and goods can be made available for the exporting industries. There has also been talk in the City that plans may be discussed for making sterling freely convertible; but this is not generally expected at this stage, though on the other hand, it is suggested in some quarters that it might be on the agenda at the conference of Commonwealth ministers, expected in November, to discuss the sterling area's problems and gold and dollar reserves.

As was expected, shares of chemical and kindred shares have generally moved with the prevailing trend of markets, but although best prices have not been held, they show improvement in many instances on balance for the month. Imperial Chemical are now changing hands around 43s., while Monsanto 5s. shares have risen to 25s. There have been active dealings around 8s. 3d. in Reichold Chemical 5s. ordinary, following the placing of the shares on the Stock Exchange at 7s. 7½d., while the 6½ per cent preference shares were 20s. Albright & Wilson 5s. shares have moved up on balance from 14s. to 14s. 9d., Eaglescliffe 5s. shares from 14s. 9d. to 16s. 6d. and Fisons have been more active around 28s. 6d. Laporte 5s. shares at 10s. 4½d. were also higher on balance on the assumption that, when the company's promised new capital plans come along in the autumn, shareholders will probably be given preferential terms of allotment in any new issue.

In other directions, Amber Chemical were around their par value of 2s., F. W. Berk 2s. 6d. shares strengthened from 5s. 7½d. to 6s. and A. Boake Roberts 5s. shares have been steady at 13s. following publication of the financial results. Eaglescliffe 5s. shares firmed up from 15s. 9d. to 15s. 6d., while

Brotherton 10s. shares were 22s. 3d. and W. J. Bush kept firm at 50s. on the past year's results. Elsewhere, Greef Chemicals moved up from 14s. to 14s. 9d., Hickson & Welch have been steady at 9s. 9d., Pest Control shares were 4s. 3d. and J. & J. White moved up to 12s. Among plastics, British Industrial 2s. shares at 4s. 1½d. have recovered part of the decline which followed the interim dividend statement, Erinoid were 4s. 4½d., Bakelite 10s. shares 16s. 10½d., British Xylonite 23s. and Kleemann 8s. 3d. Among other shares, British Glues 4s. ordinary at 11s. 6d. lost part of an earlier rise. Lewis Berger 4s. shares at 10s. 3d. and Pinchin Johnson at 35s. 6d. reflected the recent downturn in markets and were unaffected by the news that Pinchin Johnson has taken an interest in Styrene Co-Polymers.

The 4s. units of the Distillers Co. receded to 17s. 4½d. despite the further increase in profits reported by the group. The market was a little disappointed that the dividend is unchanged at 22½ per cent as there had been hopes of an increase to 25 per cent, but it is not surprising that it has been decided to conserve resources in view of the group's widespread interests and progressive policy which must call for more capital expenditure as time proceeds. Borax Consolidated at 34s. 9d. have lost part of an earlier rise. Turner & Newall were 82s., Unilever 44s. 7½d. while British Oxygen at 74s. have risen sharply on balance, though best prices have not been held. International Bitumen Emulsions 2s. 6d. shares were 3s. 9d. on the past year's results and Coalite & Chemical 2s. shares changed hands around 2s. 1½. Oil shares were generally higher on balance, but below best levels, with Anglo-Iranian at £5 15/16 and Shell 79s. 4½.

### WHO Approves Anti-TB Name

The World Health Organisation announces that it has selected the term 'Isoniazid' to represent isonicotinyl hydrazide, the much publicised anti-tubercular drug. They express the hope that it will come into widespread use as a generic term for the compound. This name has already been approved by the American Medical Association's Council on pharmacy and chemistry.



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## Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1909 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary but such total may have been reduced.)

INDUSTRIAL CHEMICALS LTD., London, W.C. (M., 18/7/52.) 2 July, £250 debentures, part of a series already registered. £11,250 (debenture). 20 February 1952.

SOLWAY CHEMICALS LTD., Whitehaven. (M., 18/7/52.) 20 June, £1,700,000 debenture, to H.M. Treasury Solicitor; general charge. \*Nil. 12 May 1952.

### Increase of Capital

IMPERIAL CHEMICAL INDUSTRIES LTD., from £95,000,000 to £120,000,000; SOLWAY CHEMICALS LTD., from £10,000 to £300,000; UNION OXIDE AND CHEMICAL CO., LTD., £30,000 to £50,000; GOODALL BACKHOUSE & CO., LTD., from £125,000 to £150,000; REICHHOLD CHEMICALS, LTD., from £100 to £1,150,000.

## New Registration

### John Clark and Co. (Manufacturing Chemists), Ltd.

Private company. (509,835). Capital £5,000. Manufacturing chemists, carried on by Chas. A. Gardner. Directors: C. A. Gardner and Mrs. I. Gardner, C. W. N. Gardner. Reg. Office: 75/77 West Street, Sheffield.

## Company News

### The Distillers Company, Ltd.

Manufacturing and trading profits of the Distillers Company, Limited, and its subsidiary companies for the year ended 31 March, 1952 was £21,729,345 compared with £18,411,095 in the previous year. Net profit

attributable to the Group was £7,170,450 (£6,858,925). An interim dividend of 3 3/5d., less tax, per 4s. unit was paid on ordinary stock. A final dividend of 7 1/5d. per 4s. unit, less tax, is recommended, making 10 4/5d. for the year (same).

### Hardman and Holden, Ltd.

Net profit of Hardman & Holden, Ltd., after increased outlay of £46,915 on repairs to plant and equipment, increase of £9,585 in depreciation charge and after tax £78,238, amounted to £109,661 for the year ended 31 March, 1952, compared with £123,046 in 1951. A final dividend is recommended of 17½ per cent (same), making 27½ per cent on the increased capital.

### Lewis Berger and Sons

In spite of increased production and overhead costs record sales were achieved by the Lewis Berger & Sons group in the year ended 31 March, 1952. Group profit rose by about 15 per cent, from £810,054 to £930,010. A final dividend of 14 per cent is recommended on the £1,581,825 ordinary capital as increased last February by a 50 per cent interim bonus issue. With the 6 per cent interim dividend on smaller capital this makes a total equivalent to 18 per cent, less tax, on the present capital, compared with an equivalent of 15 per cent for the previous year on that same capital.

### Boots Pure Drug Co., Ltd.

The hampering effect of building restrictions on its research department which was still working under conditions of great difficulty were referred to in the statement by the chairman, Lord Trent, at the 64th annual general meeting of Boots Pure Drug Co., Ltd., held on 17 July. Agriculture offered an important field of activity for chemical enterprise, and the company was paying increased attention to the agricultural, veterinary, and horticultural field. Sales in the 12 months ended 31 March, 1952, exceeded the record of the previous year. After 31 December, 1951, however, there was a slowing up, and this combined with a fall in gross profits due to reductions in prices and ever-increasing cost of salaries, wages, and taxes had adversely affected the final results. Net profits of Boots Pure Drug Co., Ltd., was £748,119 against £845,375 in 1951 and £720,378 for the year end 31 March, 1950.

## German Symposium on Fats

THE fourth post-war annual general meeting and symposium of the Deutsche Gesellschaft für Fettwissenschaft (DGF), Münster, Germany, will be held in Düsseldorf from 6-10 October. The DGF was formed in 1935 as the successor to the Wizöf which was recognised as the organisation responsible for the compilation and publication of the standard methods for the fat industry.

In 1945 membership of the DGF was approximately 1,500, of whom 300 were foreign members. The wide scope of the society is indicated by its 12 committees which are as follows:—General chemistry of fats; physical chemistry of fats; chemical constants and analysis (standard methods); oil-seeds; edible fats; soap and soap-containing products; synthetic detergents; paints and varnishes; waxes; biology of fats; fats in cosmetics and pharmacy; machinery and equipment.

The preliminary programme of lectures will be available shortly and Dr. L. Ivanovsky, F.R.I.C., M.I.Chem.E., 'Glenbrook' 68 Park Street, Bridgend, Glamorgan, will be pleased to answer any inquiries regarding participation in the symposium.

## Houdriflow Cat Cracker

IT has been announced by Houdry Process Corporation and their foreign representatives, World Commerce Corporation S.A., New York, that Albatros S.A. Belge pour le Raffinage de Petrole will install a Houdriflow catalytic cracking unit at their Antwerp, Belgium, refinery. This moving-bed installation, employing a gas-lift for catalyst circulation, is designed for a nominal capacity of 3,600 barrels per day.

The agreements just concluded for the expansion and modernisation of the Antwerp refinery also call for a feed preparation unit, a gas recovery and stabilisation unit, a plant for the polymerisation of light olefines produced in Houdriflow cracking operations, and new facilities for treating straight-run and catalytic gasolines.

Petrocarbon Ltd., of Manchester, are consultants to Albatros S.A. The mechanical engineering, drafting and procurement are being handled by Head Wrightson Processes Ltd., of London, working in conjunction with Houdry Process Corporation.



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# CLASSIFIED ADVERTISEMENTS

## SITUATIONS VACANT

*The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-50 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.*

**HER MAJESTY'S COLONIAL SERVICE**  
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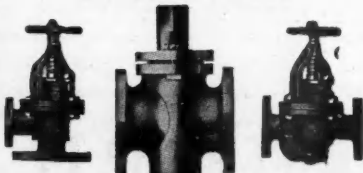
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